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ACADEMIC EARMARKS—PART III

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Academic Earmarks-Part 3, (No. 174)...

HEARINGS

BEFORE THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRD CONGRESS

SECOND SESSION

SEPTEMBER 21, 22; OCTOBER 6, 1994

[No. 174]

Printed for the use of the
Committee on Science, Space, and Technology

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ACADEMIC EARMARKS—PART III

WEDNESDAY, SEPTEMBER 21, 1994

House of Representatives,
Committee on Science, Space, and Technology,
Washington, DC.

The committee met, pursuant to call, at 10:45 a.m. in room 2318, Rayburn House Office Building, Hon. George E. Brown, Jr. (chairman of the committee) presiding.

The Chairman. The committee will come to order.

I'm going to ask unanimous consent that today's hearing be open to coverage by print and broadcast media, including still and video photography.

Hearing no objection, that will be the order.

There is a note in front of each member, at least up at this stage, as to the existence of C–Span microphones attached to the regular mics, and I hope that all the members will read that. It will help them to avoid incautious remarks they might otherwise make.

I have an opening statement, which I usually don't read, but because of the situation this morning in which a number of members are engaged in other meetings and will be here shortly, I am going to take up a little time by reading my opening statement. I hope you'll all forgive me.

Today's hearing marks the third in a series on academic earmarks. This committee has a longstanding interest in this issue based on our concern that the increased reliance on earmarking to distribute Federal funds to our Nation's colleges and universities will undermine legally established programs of peer and merit review.

Further, relying on earmarks to distribute Federal research dollars means that those dollars are awarded not on the basis of merit, not on the basis of need, but on the basis of political muscle and personal relations.

I might interject that of course many Members of Congress think this is the best way to allocate money, but we do have some dispute over that.

Finally, as witnesses this morning will attest, earmarks play havoc with priority setting at Federal agencies and crowd out other researchers who lose their funding or lose the opportunity to pursue funding because of the earmarks.

As most of you know, my objections to such earmarks rests on the process by which the money is allocated rather than on the merits of a particular project. Whether those merits are judged to be outside the scope of a funding agency or when evaluations of projects are critical and yet the funds are awarded anyway, I may be more inclined to ask hard questions about why an agency is providing such funds.

During the last year members of this committee have worked with me to try to put a lid on academic earmarks. We've seen some progress. Overall, academic earmarks appear to be down from almost $800 million in fiscal year 1993 to approximately 600 million in fiscal year 1994.

We have also lost some ground, as last week's vote on earmarks in the VA–HUD appropriations bill demonstrates. Those earmarks included $68 million that was set aside for academic institutions. Soon the House will take up consideration of the Defense Appropriations conference report. In recent years, the Defense Appropriation has had the lion's share of all academic earmarks.

In fiscal year 1993, academic earmarks at Defense accounted for approximately one-third of all earmarks at $275 million. In fiscal year 1994 academic earmarks at Defense accounted for approximately 45 percent of all earmarks at $281 million.

Even as Congress closes out this session with a rush to move out appropriation bills, executive agencies will be reviewing those bills and the accompanying reports for earmarks. As many of you are aware, I have been attempting to get the attention of executive agencies on a crucial point, that point being that report language earmarks are advisory in nature, they are not the law of the land, they do not represent the intent of Congress, and you do not have to fund every suggestion that comes out of a closed-door conference meeting.

Samuel Johnson noted that when a man knows he is to be hanged in a fortnight it concentrates his mind wonderfully. I hope that this hearing will provide an opportunity for our agencies to pay more heed to this issue.

For all these reasons, this hearing and the testimony we will receive today and tomorrow is coming at a very important time. I anticipate hearing three arguments this morning: that agencies are merely doing what Congress tells them to do; that earmarks are a way of leveling the playing field so that have-not schools get their share of funds; and that Congress, in reality, members of the Appropriations Committee, has as much right to specify how funds are spent as does some bureaucrat in an office on the other end of Pennsylvania Avenue.

The first argument is accurate as it applies to legislative earmarks. When an earmark is included in a bill that is subject to debate, amendment and approval by both houses of Congress and signed into law by the President, then yes, Congress is telling an agency how to spend its funds.

However, when a subcommittee writes a report to accompany a bill or when conferees come back from conference with report language, that language is not in any way, shape or form an expression of congressional intent. Such language is purely advisory in nature and represents the views of the handful of members who were party to the conference.

This interpretation of the status of report language is not mine alone. The principle has recently been reiterated by the Supreme Court in *Lincoln* v. *Vigil* and *American Hospital Association* v.

NLRB. Judge, now Justice, Scalia, succinctly stated the rule as follows, and I quote:

> The issue here is not how Congress expected or intended the Secretary to behave, but how it required him to behave through the only means it can, the only means it can require anything, through the enactment of legislation. I understand the desire of agencies to maintain good relations with Congress, both appropriators and authorizers. However, this cannot be done at the expense of sound administration of public funds.

Yet that is just what is being sacrificed when an agency that has no mandate or interest in, say, a hospital beside that it will provide millions of dollars for such a project on the say-so of a handful of members.

The second argument that peer review is the revenge of the have-not schools hinges on a mix of fictions. The first fiction is that peer review is nothing but an "old boy" network that guarantees that the rich will stay rich and the poor will stay down.

As the GAO report—review of peer review demonstrates, peer review panels at NSF are disproportionately composed of scholars who are not from elite institutions. While that review of peer review raise good questions about the process, it disconfirms the old saw that the Harvards and Stanfords of the world sit down every year to decide how to carve up the pie.

The second fiction in this second argument is that earmarks are done to make sure that have-not schools get their fair share of Federal support. Among the have-not schools that have been singled out for earmarks in recent years are the University of California at Berkeley, Harvard, M.I.T., the University of Michigan, Pennsylvania State, the University of Pittsburgh, Johns Hopkins, and the University of Washington. These schools all rank among the top 20 in total Federal support for research and development.

These are hardly have-not schools, but once the dam on earmarking is broken down and the money is flowing, pretty soon everyone is tempted to dip their bucket into the stream.

The final fiction is that earmarking is the only way to redress unfairness in the distribution of Federal research dollars. The process of earmarking relies on an Appropriation Committee patron in the House or Senate to make an earmark for a school. Without that an earmark will not be made.

This highlights the tenuous nature of earmarking as a funding source. If one's patron dies or retires or is defeated, one's cash flow is likely to slow to a trickle or even dry up. Any system of equity that depends on an individual will fail.

To systematically redress imbalances in Federal funding, we need systematic programs that will allocate dollars fairly. That is what the EPSCOR program is about. That is what the special programs which have been authorized to support institutions serving historically disadvantaged populations are about.

Equity and fairness is a matter for law, not for closed-door dealmaking and political favoritism. These half truths that peer review is unfair, that earmarks go to have-not schools, and that earmarks provide a fairer way to redress unfairness become the cloak behind which a powerful set of members make some pretty strange recommendations about how Federal tax dollars should be spent.

The final argument we are likely to hear is that Congress is simply exercising its prerogative to direct spending by the executive branch, and that members of the Appropriations Committee has as much right or more as any civil servant to make funding decisions.

I accept this argument so far as Congress acts to direct that spending by including particular authorized projects in appropriations bills. I do not believe this claim can hold when it comes to report language directing expenditures for unauthorized programs.

In the case of earmarks actually included in bills, and these are very rare, obviously the Constitution grants Congress power over executive expenditures. However, I do not believe that the drafters of the Constitution expected Members to use that as their justification for parochial spending in their home States and district.

In fact, Hamilton specifically condemned such spending in his report on manufacturers in which he wrote, and I quote Hamilton at length:

> It is therefore of necessity left to the discretion of the national legislature to pronounce upon the objects which concern the general welfare and for which under that description an appropriation of money is requisite and proper, and there seems to be no room for a doubt that whatever concerns the general interests of learning, of agriculture, of manufacturers and of commerce are within the sphere of the national councils as far as regards an application of money. The only qualification of the generality of the phrase in question, which seems to be admissible, is this: that the object to which an appropriation of money is to be made be general, and not local; its operation extending in fact or by possibility throughout the Union, and not being confined to a particular spot.

Of course, appropriations confined to a particular spot is what distinguishes earmarks.

Every recipient of an earmark is going to swear up and down that their project does have national importance. But the truth is that if a project is that important, if the need for the research is that pressing, the project should be able to compete and win its fair share of research dollars which are made available to executive agencies to meet real national needs. Further, if it is a truly national need there should be an authorization which represents congressional recognition of that need.

I'm going to shorten this a little bit, if I may. And I do expect that over the next few years more of my colleagues will join me in working to reduce academic earmarking. I also expect the executive departments to be held accountable for their funding decisions, and that is why we have invited some of them to be here this morning.

Some of my friends in the executive branch say earmarking is a congressional problem that needs to be solved in-house. I agree in part, and I will continue to pursue the kinds of reforms that will bring this under control. But regardless of the fate of those reforms, executive agencies are not off the hook for how they manage Federal dollars.

I welcome our witnesses this morning and thank them for joining us. Before recognizing our first panel, I would like to recognize the distinguished gentleman from Wisconsin, the ranking member present, for any remarks he may have.

Mr. SENSENBRENNER. Today, the gentleman from Wisconsin is a man of few words, and I yield back the balance of my time.

The CHAIRMAN. Thank you very much. I am going to, of course, allow Mr. Walker at such time as he arrives an opportunity to make some opening remarks.

Any other member here desire to offer a few opening remarks? If not—Mr. Fawell, whom I intended to pay tribute to is one of the most active members on either side seeking to control the force of earmarking, and I'd be happy to hear a few words from him.

Mr. FAWELL. Well, and indeed only a few words. I want to commend the chairman for continuing these hearings in regard to this difficult subject of earmarking.

The chairman has referred to an event that took place on the floor just last week in regard to the VA–HUD bill, where some $290 million was taken from a low income housing project spending and then cut up between the House and the Senate. I think 135 million in special funded projects are going to districts of—going to States of the various Senators, and then 155 million, I think, divided among House Members, most of them basically those areas represented by the Senators and the Members who were on the Conference Committee.

That is discouraging when you see that happen. And a good proportion of that, some 68 million, as the chairman has pointed out, were scientific grants. But, on the other hand, it was a very, very close vote, and I can attest to the fact that in previous years when that has occurred we, speaking of the pork busters group—and the chairman, I am proud to say, is a member of the pork busters group—we didn't get too close.

Now, I think things are changing. There are many people on both sides of the aisle who are standing up and objectively expressing themselves and pointing out that we don't have the funds that we can just award on bases where there is no authorization, no peer review, no competition, and things of that sort.

So, I applaud the chairman for consistently and objectively and fairly pressing the point here and really delving into it so that we can make intelligent, I think, decisions on just how we can best handle the situation.

Times are changing, though, and that is the important thing. We actually, I think, won that vote, and then time was extended and elbows and arms twisted and things of that sort, and we ended up losing by just 9 votes.

But obviously, it is getting very even, and I think in the next session you are going to see even more of an attitude in favor of recognizing that we cannot countenance, especially in the scientific area, earmarking.

And I again applaud the chairman for bringing this matter again before this committee.

The CHAIRMAN. We thank the gentleman for his applause. And I hope that that will be all the applause we need this morning.

Mr. Roemer, you are not going to applaud me, are you?

Mr. ROEMER. If you don't need any applause or accolades, Mr. Chairman, and you want this to get on to our distinguished panel I would be happy to greatly abbreviate my——

The CHAIRMAN. Put your remarks in the record?

Mr. ROEMER. I'm happy to ask unanimous consent to put my very, very complementary remarks about our chairman in the record. [Laughter].

The CHAIRMAN. Thank you very much, Mr. Roemer. You are a true statesman and your actions will not go unremarked and unnoticed.

[The prepared statement of Mr. Walker follows:]

STATEMENT OF THE HONORABLE ROBERT S. WALKER
HEARING ON ACADEMIC EARMARKING
SEPTEMBER 21, 1994

Mr. Chairman, I am pleased to join you once again in this continuing series of hearings on the practice of earmarking funds to academic institutions. The hallmark of American science has been a system based on a competitive, peer-reviewed grant process, and the result has been a scientific capability unequalled anywhere else in the world. You and I have both gone to the floor on numerous occasions to deplore the earmarking of science money. I said at last year's hearing that we had made some progress in convincing our colleagues that earmarking undermined the authorizing process. This year, unfortunately, we have witnessed some backsliding.

The latest instance of this practice came in last week's consideration of the conference report making appropriations for the Departments of Veterans Affairs, HUD, and Independent Agencies, where I was disappointed to find that this legislation contained $70.4 million in earmarks for academic institutions. Clearly, the Department of Housing and Urban Development is hardly the agency best suited to administer academic programs, especially ones that deal with science, technology, and health research. This type of earmarking is an abomination and should be rejected. Most of the amounts for individual projects were not large; they ranged from several tens of thousands to several million dollars, but together, they totalled $290 million.

The VA/HUD bill was just one example of pork barrel politics, which especially during election years, has become an insidious problem. To divert money from national interest objectives for the sake of political gain is not serving our constituents or our country. To add to the budget deficit for the sake of a press release is not in the best interests of our districts or the country.

We will hear from witnesses today and tomorrow that the grants made to the various institutions were targeted to worthy causes, and that earmarking is a way directing research dollars from the so-called "haves" to the "have-nots." The statistics simply do not support that theory. In fact, a recent Congressional Research Survey found that the top ten state recipients of peer-reviewed federal research dollars are also among the tope five beneficiaries of academic earmarks.

As entitlements make up an ever-larger percentage of the federal budget, the competition for discretionary funds, including research money is bound to become fiercer. The reliance on political clout to deliver research money may help certain academic institutions in the short-run, but it seriously jeopardizes the integrity and quality of the United States' basic research capability in the long-term.

Thank you, Mr. Chairman.

The CHAIRMAN. Let me introduce the first panel. We have with us this morning, and we are very pleased to have them, Dr. Marcie Greenwood, who is the Associate Director for Science at the Office of Science and Technology Policy in the White House; Dr. Martha Krebs, Director of the Office of Energy Research at DOE and well-known to this committee as a former senior staff member a few years ago; and we have from EPA Mr. Jon Cannon who is the Assistant Administrator, Office of Administration and Resources Management, and accompanied by Dr. Robert Huggett, who is the Assistant Administrator of the Office of R&D.

This panel, of course, is well aware of the problem. We invite them here to present their views of the earmarking situation and defend whatever practices their particular agency has for dealing with these matters.

And we are going to be friendly but critical of whatever you say. That is just a warning.

Marcie, do you wish to proceed?

STATEMENTS OF MARTHA A. KREBS, Ph.D., DIRECTOR OF ENERGY; RESEARCH, U.S. DEPARTMENT OF ENERGY, WASHINGTON, DC; M.R.C. GREENWOOD, Ph.D., ASSOCIATE DIRECTOR FOR SCIENCE, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, WASHINGTON, DC; AND JONATHAN Z. CANNON, ASSISTANT ADMINISTRATOR, OFFICE OF ADMINISTRATION AND RESOURCES MANAGEMENT, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC, ACCOMPANIED BY ROBERT J. HUGGETT, Ph.D., ASSISTANT ADMINISTRATOR, OFFICE OF RESEARCH AND DEVELOPMENT

Ms. GREENWOOD. Once again, thank you very much, Mr. Chairman, and the members of the committee. I am delighted to be here this morning to talk with you about the Administration's approach to the issues you raised in the letter that you sent to Jack Gibbons earlier, a few weeks ago.

First of all, let me commend you again for holding this hearing on academic earmarks and furthering the national discussion on how best to support and maintain the world's leading research and development enterprise.

The main reason, I think, that this issue of academic earmarking is so important, although perhaps it sounds esoteric to some, is that it really impacts on our primary, indeed our only really proactive, long-term program that the Nation has for saving lives and for developing the intellectual capital, the intellectual knowledge and the tools to allow us to save lives, to help the environment, to provide for our national and economic security, and to help develop new ideas that will help us work toward solving some of the social ills that our extraordinarily complex culture brings to us, and those that you all struggle with every day of your life here in Washington.

We understand how difficult the choices that have to be made are and how important they are for the future of the country. The problem, of course, is that in the context of our overall expenditures on this Nation's programs we have roughly a $1.5 trillion budget on an annual basis. We spend about $70 billion of this on research and development—these are sort of 1993 figures—around 11 billion on university and non-profit research.

When you calculate that out, it is less than 1 percent of the annual budget in any year that we are spending on this seed corn and intellectual capital for the future. So, although in gross terms the investments we make in R&D in this country, and particularly the investments we make in our institutions of higher learning and in non-profit organizations, is not a huge number. It would be viewed and probably should be viewed as the seed corn or the test bed for the future of the Nation's ideas and abilities to move forward. And it is for that reason that the issues that you raise are so important for us to consider in a careful and systematic way.

Let me take the three questions that you asked in order and touch on them briefly. Some of the things I am going to say will reinforce some of the information that Chairman Brown has brought forward. I'll try not to be redundant, but I think it is important to touch on those.

First of all, I did provide for the committee a paper that—a reproduction from the recent Chronicle of Higher Education that address the issues and trends in earmarking, and, as the chairman has said, there has been a reduction between 1993 and 1994, a trend that the Administration applauds and would like to see continue.

The primary problem with academic earmarking is that it is not carried out in the context of national agency or congressional priority setting. With the limited resources that are available to appropriators, we have to understand that earmarks divert funds from key research programs to programs that are not as essential to the development of national goals.

And because earmarking is not a competitive process, it can result in a lower quality scientific product. Much of the tremendous success of the American science and technology effort is, I believe, directly attributable to the merit-based peer review process that we have developed in this country over decades and which depends very critically on a consultative process in setting priorities and on the best information of the best trained scientists and policymakers, I think, in the world.

We encourage investigator-initiated research that allows unique ideas, but we also encourage mission-oriented research that allows agencies to pursue research programs that accomplish their missions. The practice of earmarking runs counter to this very process which has been the basis of the success of the program in this Nation.

And, as the chairman briefly reviewed, a recent General Accounting Office, a GAO report of June in this year did find that the peer review process was working reasonably well, and that counter to what some critics have asserted reviewers were not more likely to come from the lead institutions and they were not more likely to come from a particular region of the country.

Therefore, I think we can rest assured that the basic underlying principles of the peer review system in this country are in fact equitable and unbiased, although this is not to say, as the GAO report clearly pointed out, that we can't improve an already good system.

I want to just take a minute to talk about the two types of academic earmarking as we see them. The type of academic earmarking that I imagine we will focus on this morning is primarily the direct earmark to a specific recipient institution, individual or group to do either a specific project or to build a specific facility.

This type of earmarking stands the least chance of undergoing a good scientific review because of the problems of taking them out of the competitive selection.

The second form of academic earmarking provides funding for programs or facilities but don't direct the money to a specific recipient. That does allow more freedom in the agencies to select a competitive—to develop a competitive process to allow such a program to go forward, but it doesn't ensure that the program is in any way a good match to the overall priority-setting process that people have put a good deal of effort into.

Perhaps the most charitable view of earmarking is that you could see it as a symptom of the success of the U.S. science and technology effort. Academic earmarking results from the fact that academic institutions with quality science and technology programs historically have gained prestige, they have offered superior training to their graduate students, they may have spawned local industries, and they have led to economic prosperity in local districts.

Thus, it has obviously now become dogma that local economic and intellectual prosperity is associated with the competitiveness of local universities, and it is therefore understandable that Members of Congress and others would advocate vigorously for Federal funding of their academic institutions.

But still the strongest argument against academic earmarking is that earmarks interfere with the established policy and budget priority-making at all levels—the national, the congressional, and the agency level.

In general, then, the process of earmarking interferes with our progress towards goals, especially in this time of tight fiscal constraints. It erodes the structure of the competitive process which has made us leaders of the world in science and technology, and it inadvertently may lower the quality of our research.

It may also inadvertently discourage young scientists from pursuing research careers because they believe it is not an honest or open process.

Now, what is the Administration doing to limit academic earmarks? I want to point out that in Science in the National Interest, the recently released statement by the President and the Vice President, that they remind us that America's future investment—future depends on our investment in people, institutions and ideas, and that our scientific strength is a treasure that we have to build on for the future, and that is ever more true as we are facing these tight fiscal times.

This Administration has taken several proactive steps to try to change the environment that encourages earmarks. For example, we support the experimental program to stimulate competitive research, and, as the chairman referred to, this is a program that is intended to address the issue of potential equities in the distribution of funding and the ability to build an intellectual and economic base, based on a regional basis.

It is also the clear intent of the Administration to further the support of merit and peer review research, and this was communicated to the agencies in May of 1994 in a letter that the then OMB Director Leon Panetta and the President's Science and Technology Adviser, Jack Gibbons, sent to the agencies in which peer review was given the highest priority, and it was expected that in each agency's fiscal 1996 budget submissions research subjected to peer review, merit review with peer evaluation, would increase and funding in areas not subject to such review would decrease.

Another concern, which is the motivation for earmarking as a consequence of a lack of a broad-based substantial facilities and infrastructure renewal program, we are trying to address in these very tight fiscal times, and we have charged the National Science and Technology's Committee on Fundamental Science to develop a plan for recommending options for implementation of a multi-agency program for infrastructure renewal.

I believe it is the joint task of the Administration and this Congress to sustain those policies that will give us the best assurance of future success and to take the steps to eliminate the practices that interfere with our leadership. The most productive approach, I believe, is to work together to strengthen existing peer review programs, to develop mechanisms for ensuring broad participation in science and technology and to promote excellence throughout the country.

This investment that the Nation makes, albeit small, in science and technology is still so important that we have to commit ourselves to sustaining it and improving it overall in the future, and to keep it as healthy and free from risk as possible.

That concludes my formal remarks, Mr. Chairman. Thank you.

[The prepared statement of Ms. Greenwood follows:]

Testimony of M.R.C. Greenwood
Associate Director for Science
Office of Science and Technology Policy
Executive Office of the President

Before the
House Committee on Science, Space, and Technology

September 21, 1994

Thank you, Mr. Chairman and Members of the Committee, for this opportunity to appear before you on behalf of the Administration. I commend you for holding this hearing on academic earmarks and furthering the national discussion of how best to support and maintain the world's leading research and development enterprise. The knowledge derived from America's research and technological innovation can keep us in the forefront of international economic competition while maintaining a strong national security position, improving our environment, creating intellectual capacity, providing good jobs for our people, and improving the quality of life for our citizens.

In a letter to Jack Gibbons, Director of the Office of Science and Technology Policy, the Committee asked that the Administration appear today to respond to three specific Questions:

1. "What is the Administration's position on academic earmarking?"
2. "What effect do such earmarks have on priority setting among research programs in the Federal government?" and
3. "What steps has the Administration taken to limit or end such earmarks?"

Today, I will present the Administration's response to each of these questions.

The Administration's Position

First, let me take a moment to describe the fiscal dimension of this issue. On August 3, 1994 The Chronicle of Higher Education reviewed trends in academic earmarking from 1988 to 1994. Congressional earmarks increased from $225 million in 1988 to $763 million in 1993. That is, earmarking more than tripled in a five year period. In 1994, academic earmarks decreased modestly to $651 million, the first significant decrease in more than a decade. This is the right trend and we encourage Congress to continue it.

The primary problem with academic earmarking is that it is not carried out within the context of national, agency, or Congressional priority setting. With limited resources available to appropriators, earmarks divert funds from key research programs to programs that are not as essential to the achievement of national goals. Further, because earmarking is not a competitive process for recipients, earmarking may result in a generally lower quality scientific product.

Much of the tremendous success of American science and technology is directly attributable to the process of merit-based peer review funding that has developed over the years. In the United States, we have developed a unique and extraordinary process of competition that rests on excellence. We encourage investigator-initiated research that allows unique ideas and individual creativity to flourish. We also encourage mission-oriented research that allows agencies to pursue research programs that supports the accomplishment of their missions. Our success and leadership in science and technology is a direct derivitive of this process. The practice of earmarking runs counter to the very process of research funding that has assured excellence in American science. To destroy the system would be a national tragedy.

The General Accounting Office has examined the issue of federal research funding and the system of peer review in a series of reports. In the most recent of these studies, dated June, 1994, the GAO found that the "peer review processes appear to be working reasonably well..." The report further assures us that, "...contrary to what some critics have asserted, reviewers were not more likely to come from elite institutions than were applicants, and there were few differences in region of origin." The GAO findings thus support the contention that the system of competitive funding underlying federal research programs is generally equitable and unbiased.

There are essentially two types of academic earmarking, both of which hinder the achievement of Administration and Congressional objectives, and the fulfilment of Agency missions. Certain earmarks direct funding to a specific recipient institution or research program and identify a specific issue to be studied, or a type of facility to be constructed. Such earmarks often may interfere with goals and strategies defined by Congress and the Administration. Furthermore, recipient-specific earmarking is the least likely to yield the best scientific results because such projects undergo no competitive process of selection.

The second form of academic earmarking provides funding for facilities or programs related to specific issues but does not direct the monies to a specific recipient. Such earmarks allow agencies to select the most qualified applicant to receive the earmarked funds and some level of peer review and competition is possible. The problem, of course, is that the earmark demands activities and programs that may not be consistent with the agency missions. Thus, both types of earmarks are likely to distort agency programs and the NSTC interagency process we are working so hard to develop.

A charitable view of earmarking is to view it in part as a symptom of the success of U.S. science and technology. Academic earmarking results from the fact that academic institutions with quality science and technology programs historically have gained prestige, offered superior training to their students, and spawned local industries, leading to economic prosperity for local districts. Thus, it has become dogma that local economic and intellectual prosperity is associated with the competitiveness of local universities. It is understandable, then, that members of Congress would advocate vigorously for Federal funding for their academic institutions.

The Effects of Earmarking on National Priority Setting

Perhaps the strongest argument against academic earmarking is that earmarks interfere with established policy and budget priorities on all levels: National, Congressional, and agency.

As mentioned earlier, earmarks subvert both the priority-setting and peer review systems that have served our nation so well. On an agency level, earmarking diverts funding from projects that have been identified as essential to the achievement of agency and national goals. On a Congressional level, earmarking may run counter to the desires of the authorizing committees. On a national level, the practice of earmarking reduces the amount of support available for the best competitive projects and detracts from projects that address our national goals. In general, then, the process of earmarking interferes with progress toward goals, erodes the structure of our competitive process, and inadvertently may lower the quality of our research; such results ultimately may discourage young scientists from pursuing research careers.

Administration Efforts to Limit Academic Earmarking

In the recently released Science in the National Interest, The President and Vice President reminded us of an important tenet of our future which has longstanding bipartisan roots:

> "America's future demands investment in our people, institutions and ideas. Science is an essential part of that investment, an endless and sustainable resource with extraordinary dividends." Furthermore..."The principal sponsors and beneficiaries of our scientific

> enterprise are the American people. Their continued support, rooted in the recognition of science as the foundation of a modern knowledge-based technological society, is essential. The nation's investment has yielded a scientific enterprise without peer, whether measured in terms of discoveries, citations, awards and prizes, advanced education, or contributions to industrial and informational innovation. Our scientific strength is a treasure which we must sustain and build on for the future."

In these difficult fiscal times, we must continue to ask ourselves: How well are we investing the American taxpayers' money and how can we be assured that this investment is sound? It is because of this Administration's commitment to excellence in American science and technology that we have attempted to identify those factors which contribute to our nation's excellence as well as working to overcome factors that can serve to erode our leadership in science and technology.

This Administration has taken several proactive steps to change the environment that encourages earmarks. To address the issue of the need to build science and technology capacity in regions with less standing in the research community, we support the Experimental Program to Stimulate Competitive Research (EPSCoR), a peer reviewed program with broad bipartisan support that has worked to increase both the research and scientific and technological capacity of regions of the country where local institutions' competitiveness for federal funding was in need of assistance. Programs such as EPSCoR build state, federal, interstate, and regional partnerships, and leverage resources, but preserve elements of peer review and program evaluation. In Science in the National Interest, the Administration committed itself to a goal of maintaining,

> "...a strong commitment to Federal-state-industry partnerships for forging stronger links between the educational community and the workplace and for seeding merit-reviewed research program across the nation as important investments in developing research capabilities and associated educational benefits."

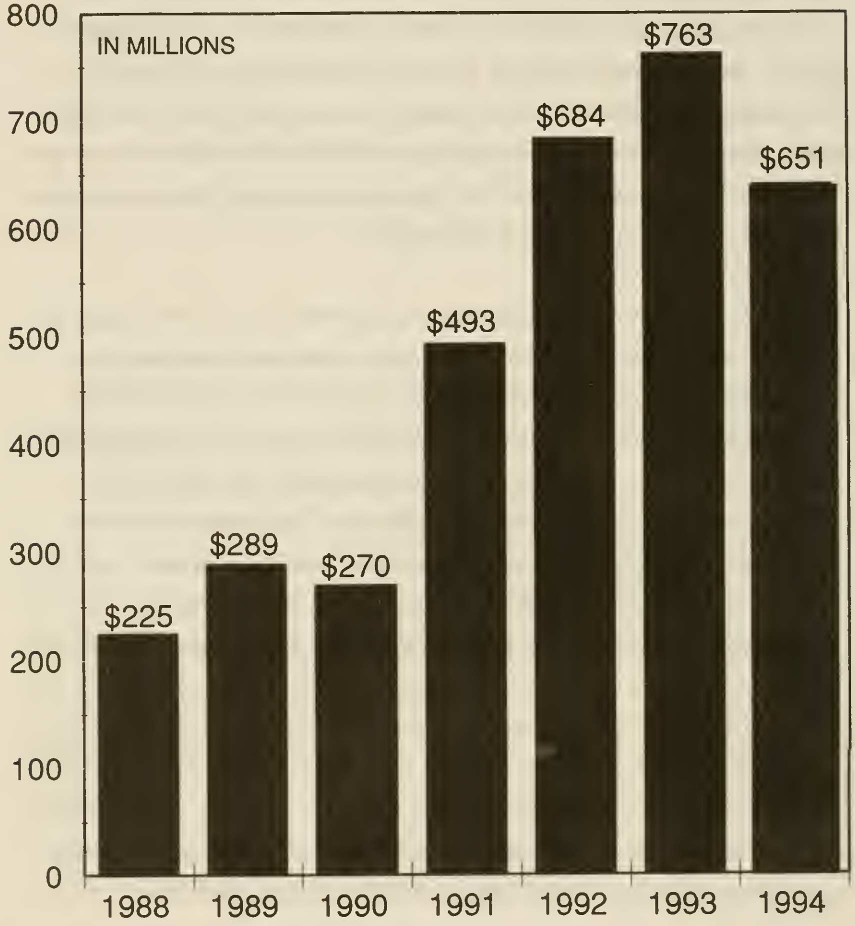
In addition, the clear intent of this Administration to fund research based on merit and peer review was communicated to the agencies in May, 1994 by then OMB director Leon Panetta and the President's Science and Technology Advisor, Jack Gibbons. Peer reviewed research was given the highest priority and it was expected that in each agency's FY 96 budget submissions, research subject to merit review with peer evaluation would increase and funding in areas not subjected to such review would decrease.

One other concern often advanced as motivation for earmarking is the lack of a broadbased substantial facilities and infrastructure renewal program. To address this concern, the Administration has charged the NSTC's Committee on Fundamental Science to recommend options for a multi-agency program for infrastructure renewal. This program would supplement the funds spent by the federal government on facilities through the use of indirect costs and grants. The preliminary report is due in mid Fall and the final report in February.

It is the joint task of this Administration and this Congress to sustain those policies that will give us the best assurance of future success and to take steps to eliminate practices that interfere with our leadership. The most productive approach for the country is to work together to strengthen existing peer review programs, to develop new mechanisms for ensuring broad participation in the process of research and development, and to promote excellence throughout the country. The nation's investment in science and technology research and development is so important that we must also commit ourselves to sustaining it and improving it overall for the future.

This concludes my formal remarks. I thank the Chairman and the Committee again and stand ready to answer your questions.

Trends in Earmarking



SOURCE: The Chronicle of Higher Education August 3, 1994

The CHAIRMAN. Thank you very much, Dr. Greenwood.

I want to proceed with the other panel members before we start questions.

Dr. Krebs.

Dr. KREBS. Thank you, Mr. Chairman.

Mr. Chairman, members of the committee, I am pleased to appear before you today to present the Department's comments and address the issue of congressional appropriations directed to colleges, universities and academic institutions.

Dr. Greenwood's testimony has addressed and set in a very fine context the issues and the Administration's position on this, and the Department subscribes to those positions.

In the following comments I would like to excerpt from my testimony to provide an additional perspective from the Department of Energy's point of view. The Department is opposed to academic earmarks for several reasons.

First, the majority of these Congressionally directed earmarks are neither requested nor supported by the Administration. As such they have not undergone a technical peer review to assess their merit and relative priority in relation to other departmental mission program activities.

We would prefer to have all projects proposed through our normal budget process so that we can review and establish priorities within our limited resources. I am particularly sensitive to this matter because two of the major Department of Energy programs that have received earmarks in recent years are the Basic Energy Sciences program and the Biological and Environmental Research program within the Office of Energy Research.

Within the office, we do take a tough look at reviewing the performance of these programs, particularly when academic earmarks become a continuing element of an energy research program.

Second, congressionally directed academic earmarks included in appropriations reports and legislation have adversely affected the Department's research agenda and related mission activities. The Department must reduce planned program activities and realign mission priorities to accommodate unfunded earmark requirements within appropriated levels.

Peer reviewed scientific priorities related to the Department's missions are not supported at requested levels. Scarce resources may be redirected for projects that have little or no relationship to the Department's priorities. Funds planned for operation of user facilities are reduced, reducing user time available to hundreds of university researchers. The basic research programs that are the foundation for laboratory and university science support are eroded.

Academic earmarks related to facility construction activities at academic institutions present unique legal, technical and administrative problems to the Department in managing and overseeing construction activities on non-government-owned property.

In terms of—you asked us to address benefits. In terms of research and development activities, it is difficult at this point in time to determine what kinds of benefits we have received from research carried out in fiscal 1993 and 1994 alone. If you go back in time, there are probably some benefits, but we believe that in fact they are quite limited because in fact these benefits come at the expense of peer reviewed activities that relate to departmental missions.

In terms of identifying academic earmarks, the Department carefully reviews Appropriations Acts as well as accompanying House, Senate and conference reports, and the Congressional Record, to identify academic earmarks. As elicited from these sources, the mandate, if statutorily required, or guidance, if proposed in legislative history, the congressional intent is formally transmitted to the appropriate managing program organization for assessment. Based on this guidance the program organization determines the proper allocation of resources and funds are subsequently made available to a particular departmental element for implementation.

Through this process the Department strives to minimize adverse impact to ongoing mission programs and activities. Despite the Department's general views and concerns related to academic earmarks, once these earmarks are received the Department does not second guess congressional direction. Once the funding has been allocated, however, we do attempt to ensure that the funds are spent properly and are consistent with the intent of Congress.

We receive grant proposals from our recipients and review the proposals for consistency with the intent of the earmark. We monitor construction progress by making site visits to ensure that the funds are spent as intended.

For research and development projects, we carry out performance reviews during the term of the project and require periodic reports. With regard to the legal effects of earmarks in report language accompanying Appropriation Acts, the Department does not regard such directions as having the full force and effect of law. However, it is the policy of the Department when executing appropriations to comply to the extent possible with guidance received from Congress.

Mr. Chairman, this concludes my formal statement. I'd be happy to answer questions.

[The prepared statement of Ms. Krebs follows:]

STATEMENT OF

MARTHA A. KREBS

DIRECTOR, OFFICE OF ENERGY RESEARCH

U.S. DEPARTMENT OF ENERGY

BEFORE THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

SEPTEMBER 21, 1994

Mr. Chairman and Members of the Committee, I am pleased to appear before you today to address the issue of Congressional appropriations directed to colleges, universities, and academic institutions. I am aware that the Committee is deeply concerned with the effect that earmarking has on the United States scientific and technological infrastructure and how it affects national priority-setting.

The Department of Energy receives funding to conduct mission program activities from both the Energy and Water Development and Interior and Related Agencies Appropriations Subcommittees. Specific funding guidance and requirements contained in report language on academic earmarks typically fall into two broad categories: research and development, and research facility construction activities. The latter entails funding facility construction or modifications typically at academic institutions.

Impact of Academic Earmarks in FY 1993 and FY 1994

The Department is opposed to academic earmarks for several reasons. First, the majority of these Congressionally directed earmarks are neither requested nor supported by the Administration. As such, they have not undergone a technical peer review to assess their merit and relative priority in relation to other Departmental mission program activities. We would prefer to have all projects proposed through our normal budget process, so that we can review and establish priorities within our limited resources.

I am particularly sensitive to these issues because the two major Department of Energy programs that received earmarks in FY 1993, FY 1994 and FY 1995 are the Basic Energy Sciences program and the Biological and Environmental Research program, which are both in my office. In the Office of Energy Research, we take a tough look at reviewing the performance of these programs, particularly when academic earmarks become a continuing element of the program. Also, many of the facility-related earmarks are not consistent with the priorities and missions of the Department.

Second, Congressionally directed academic earmarks included in appropriations reports and legislation have adversely affected the Department's research agenda and related mission activities. Since academic earmarks are sometimes directed without provision of commensurate funding, the Department must reduce planned program activities and realign mission priorities to accommodate unfunded earmark requirements within appropriated levels. More specifically, this process results in the following adverse consequences: peer reviewed scientific priorities related to the Department's missions are not supported at requested levels; scarce resources may be redirected for projects that have little or no relationship to the Department's priorities and missions; funds planned for operation of user facilities are reduced, thereby reducing user time available to hundreds of university researchers; and base research programs that are the foundation for laboratory and university science support are eroded.

Academic earmarks related to facility construction activities at academic institutions present unique legal, technical, and administrative problems to the Department in managing and overseeing construction activities on non-government owned property. The institution, rather than the Department, has the long-term interest in maintaining, modifying, and utilizing the facility as dictated by its mission needs and requirements. Thus, the Department cannot effectively manage or be responsible for these facilities on a long-term basis. Accordingly, the Department has found it necessary to vest title to these facilities with the recipient institutions.

Benefits From Funding Academic Earmarks in FY 1993 and FY 1994

In terms of research and development activities, it is difficult to determine what kinds of benefits we have received from research carried out in FY 1993 and FY 1994 alone. I believe that we can indicate that some work carried out by research grant earmarks to these institutions has benefitted Departmental missions.

The benefits derived by the Department from academic earmarks are limited because they generally are not produced by research activities directly related to Departmental missions. Earmarked investments for construction sometimes benefit the Department through strengthened institutional viability and creative scientific inquiry from the brightest students.

Departmental Process for Identifying Academic Earmarks

The Department carefully reviews appropriation acts as well as accompanying House, Senate, and Conference reports and the Congressional Record (legislative history) to identify academic earmarks. As elicited from these sources (the mandate, if statutorily required, or guidance, if proposed in legislative history), the Congressional intent is formally transmitted to the appropriate managing program organization for assessment. Based on this guidance, the program organization determines the proper allocation of resources, and funds are subsequently made available to a particular Departmental Element for implementation.

As previously discussed, academic earmarks are sometimes directed without associated funding. The Department must in turn identify the necessary resources from within existing funding levels by addressing earmark requirements, together with general and program-specific reductions, in an overall assessment to determine appropriate funding levels and sources. In this process, the Department strives to minimize the adverse impact to ongoing mission programs and activities.

Evaluation Process for Reviewing Academic Earmarks

Despite the Department's general views and concerns related to academic earmarks, once these earmarks are received, the Department does not second-guess Congressional direction. Once the funding has been allocated, we do attempt to ensure that the funds are spent properly and are consistent with the intent of Congress. We receive grant proposals from our recipients of earmarked funds and review the proposals for consistency with the intent of the earmark. We monitor construction progress by making site visits to ensure that the funds are spent as intended by Congress. For research and development projects, we carry out performance reviews during the term of the project and require periodic reports. We expect to continue to use this process for FY 1995 earmarks.

Legality of Academic Earmarks

With regard to the legal effect of earmarks in report language accompanying appropriation acts, the Department does not regard such directions as having the full force and effect of law. However, it is the policy of the Department when executing appropriations to comply, to the extent possible, with guidance received from Congress, whether mandated by law or requested in report language.

Mr. Chairman, this concludes my formal statement. I would be pleased to answer questions on this testimony from the Committee.

The CHAIRMAN. Thank you very much, Dr. Krebs.

We will now hear from Mr. Jon Cannon, Assistant Administrator, Office of Administration and Resource Management at EPA.

Mr. CANNON. Good morning, Mr. Chairman, and members of the committee. Thank you very much for the opportunity to be here today.

I am accompanied today by Dr. Robert Huggett, who is our newly confirmed Assistant Administrator for Research and Development, and I am hopeful this morning that Dr. Huggett will have an opportunity to discuss with the Committee plans that he has with the Office of Research and Development to further the cause of science at EPA and to improve peer review and other elements of our scientific program as alluded to earlier by the Chairman.

EPA recognizes the prerogatives of Congress to establish our budget and to set priorities through that process. However, we do work hard during the formation of the budget request, that ultimately is the President's request, to identify the most pressing environmental priorities that we have and to fulfill our mission as best we can within the limited resources that we are given.

Recently, we are committing to a research agenda that will sharpen, we hope, our ability to focus research dollars where the priorities are most urgent and to address our research program to the areas where environmental risk is most uncertain and where we think we can get the most for our dollars.

In that regard we certainly do not solicit—do not support academic earmarks, because they frustrate our ability to do that. We would much rather rely on our normal budget processes and peer review processes to establish our work priorities.

Nevertheless, we do receive earmarks, as the Chairman has mentioned. We identify them from several different sources, including bill language, the reports of the Senate, the House and the Appropriations conference.

After we review this language we compile a list of the items much as Dr. Krebs has described in the Department of Energy. Those items are sent out to the program offices and steps are taken to fund those items as appropriate.

We do work hard in that context to ensure, particularly where an academic institution is directed, that to the greatest extent possible the research meets the requirements of our mission. The projects that result from academic earmarks are still required to submit a written proposal. That proposal is reviewed and deficiencies are sought to be corrected. We intend with our new science program that Dr. Huggett is working on to ensure that all academic earmarks are subject to peer review as are our traditional ORD grants.

We attempt to ensure that the products paid for by earmarked dollars provide information that compliments the Agency's mission and research plans and represent good science.

The impacts of academic earmarks are considerable. In fiscal year 1994 we had, as the Chairman has noted, a downturn in academic earmarks, but generally—and this is a statement about our overall earmark situation. Generally, we have been experiencing increases in earmarks over the last 4 or 5 years, and this has happened during a time when we are facing, as all of you know, increased limitations on our resources.

When Congress does not appropriate funds that go with the earmarks, we must cut other programs, including our competitive grants programs for which we have requested funding through the budget process.

Because the earmarks are not subject to competitive peer review, as has been previously discussed, they do undercut our goal of good science and engineering. And, as Dr. Huggett may have the opportunity to discuss, we have an ambitious program to improve that effort within the agency for which we have high hopes.

With that let me end my statement here and invite the committee to ask its questions. Thank you.

[The prepared statement of Mr. Cannon follows:]

TESTIMONY OF
JONATHAN Z. CANNON
ASSISTANT ADMINISTRATOR FOR ADMINISTRATION AND RESOURCES MANAGEMENT
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U. S. HOUSE OF REPRESENTATIVES

September 21, 1994

OPENING STATEMENT

Good morning, Mr. Chairman and Members of the Committee. I am Jonathan Z. Cannon, Assistant Administrator for Administration and Resources Management, United States Environmental Protection Agency (EPA). I am accompanied today by Dr. Robert J. Huggett, Assistant Administrator for Research and Development. I am pleased to be here today to testify on behalf of Administrator Browner on the subject of academic earmarks.

AGENCY POSITION ON CONGRESSIONAL EARMARKS

Mr. Chairman, let me begin by stating a general EPA policy regarding Congressional earmarks. We recognize the Congressional prerogative to establish our budget and set forth environmental priorities. However, during the formulation of the President's budget request, the Agency works very hard to identify and respond to the most pressing environmental priorities and to fulfill our fundamental mission. Therefore, EPA does not solicit nor does it encourage Congressional earmarks. Instead, we prefer to rely on the normal budget and peer review processes to establish the priority of our work. The President's budget, submitted annually, proposes budgetary resources for those areas the Agency has identified, through careful evaluation, as high priority. It is our view that the best use of the limited Federal environmental R&D funds for developing the information necessary to address these priority areas is through fair and open competition.

IDENTIFICATION OF EARMARKS

The Agency identifies earmarks from several different sources. We review bill language, as well as House, Senate, and conference report language. As you know, most earmarks are found in report language, and some are further clarified in colloquies from House and Senate floor action. After a review of this material, we compile the list of items which the Congress has directed the Agency to fund, and issue those funds to the appropriate office within EPA.

BENEFITS/RFSULTS OF ACADEMIC EARMARKING

I would like to distinguish between earmarks that specify recipients versus those that do not. As I stated earlier, the Agency recognizes the prerogative of the legislative branch in establishing our budget and identifying priorities. We believe that general earmarking that does not specify the recipient can be a more useful reflection of Congressional priorities. For example, in our FY 94 Appropriations Act, there is a general earmark for indoor air research in the amount of $350,000. Since this earmark does not specify a recipient, EPA is better able to maintain the integrity of its process to ensure that the best available approach and expertise are provided with these funds.

The Agency believes that tapping into the creativity and expertise of academia is essential to its goal of achieving the highest quality science and engineering in support of its decisions. Working with academia provides an excellent opportunity to broaden the pool of available resources to address a number of environmental issues.

The recently completed Agency review of our organization and approach to science reaffirmed this position. One of the review's main recommendations is an expansion of the partnership between EPA and the Nation's environmental research community to carry out the Agency's environmental research mandate through an increase in assistance agreements. Specifically, we plan to provide, by FY 1997, $100 million annually for ***competitive, peer-reviewed,*** investigator-initiated grants to the academic and scientific community. In addition, we will greatly expand our graduate fellowship program to help develop the scientific talents needed to address current and future environmental challenges. These actions are in addition to present cooperative agreements between EPA and academic institutions. These actions will make it easier for EPA and the academic community to build on-going partnerships across a broad front of environmental science and technology areas and assist EPA in achieving its mission.

IMPACT OF ACADEMIC EARMARKS ON AGENCY RESEARCH

With regard to Congressional earmarks for specific academic institutions, there are a number of issues which I believe underscore the overall impact on the Agency's mission. Except for FY 1994, the Agency has experienced a general increase in the number of academic earmarks over the last 4 to 5 years. At the same time, the Agency has faced increased needs with limited resources. Consequently, earmarks can result in deviation from the specific programs developed around national priorities established by the Administration and the Congress, and diminish the Agency's ability to carry out its carefully considered goals. That is why the Agency strives to ensure that all research undertaken by an academic institution (earmark) fits within EPA's current or future research agenda.

In addition, academic earmarks are sometimes directed in the legislative process without providing a similar increase in funding. When Congress does not appropriate enough funds to cover the cost of its earmarks, the Agency must cut important programs (including competitive grants programs) for which the Administration has requested funding.

Finally, by their nature, earmarks are not subject to competitive peer review, thus putting in jeopardy our goal of high quality science and engineering. They also undercut the Agency's goal of seeking to increase the competition for its resources.

EPA is committed to developing and maintaining a scientific research program of the highest quality. Peer review is an integral means of achieving such a program. Congress has urged us to improve our peer review processes, and we are working in partnership with the National Research Council and the National Science Foundation to evaluate our current practices, to make improvements where necessary, and to ensure that merit-based, peer review processes are used in the awarding of EPA's research funds.

EVALUATION OF ACADEMIC EARMARKS

When funding is directed to a specific academic institution, the Agency meets the intent of Congress while ensuring to the greatest extent possible that the research meets the requirements of the Agency's mission. The projects resulting from academic earmarks are required to submit a written proposal which details the work to be undertaken with the funds, the outputs expected, and a number of other scientific management issues. We work with the institution to address any deficiencies in its proposal to the maximum extent possible before the funds are awarded. We attempt to ensure that the products paid for by earmarked dollars provide information that complements the Agency's mission and research plans and that they represent good science.

EARMARKS FOUND IN REPORT LANGUAGE

The Agency recognizes that earmarks contained in report language do not carry the force of law and, therefore, that the Agency has some discretion in funding earmarks. Although earmarks found in report language are not *legally binding*, the Agency makes every attempt to adhere to the intent of Congress.

CLOSING STATEMENT

In conclusion, I would like to thank you once again for the opportunity to testify before you today. At this time, Dr. Huggett and I would be happy to answer any questions you may have concerning Congressional earmarks and the EPA.

The CHAIRMAN. Do you have a statement, Dr. Huggett, that you would like to present at this time?

Mr. HUGGETT. No, sir, I do not.

The CHAIRMAN. Let me make a few brief observations. To the representatives of Department of Energy and EPA, each of you, you have both indicated that you don't like earmarks, that you think they are deleterious, and yet you are going to continue to go on earmarking because you feel that that is either the will of the Congress or for some other reason.

Would you be able to explain to me why you would proceed to carry out an earmark contained in report language when you have acknowledged that it does not have the effect of law, each of you?

Mr. CANNON. Why don't I—since my light is on, Mr. Chairman, why don't I venture forward? I am extremely sensitive to your remarks about the hanging previously cited, but let me venture a response here.

We attempt in our interpretation of the appropriations bills and the report language to discern to the best of our ability the intent of Congress. And I acknowledge the Chairman's remark that on a strict legal reading we are not compelled by report language to honor the contents of the report language, but we do believe that that is an indication, a further indication of intent and therefore we do follow a policy of implementing that language.

The CHAIRMAN. That is not a good enough answer. If I were to call you up and indicate it was my intent to spend a certain amount of money in California for a lab I happen to like, would you do that?

Mr. CANNON. We would take that under consideration. But I have to admit to the chairman that that would not have the same force as report language in the appropriations bill.

The CHAIRMAN. Do you ever have phone calls from staff members of the Appropriations Committee indicating what they think is the intent of Congress and asking you to carry it out?

Mr. CANNON. We do have discussions when report language and the appropriations language is unclear with staff in an attempt to determine what the intent of that language is.

The CHAIRMAN. And then you carry it out?

Mr. CANNON. To the best of our ability to understand it——

The CHAIRMAN. Even though it requires you to take money away from programs that have been enacted into law, have the support of the President, and have been passed by the entire Congress?

Mr. CANNON. That is true. The extent that we believe it is the intent of the committee.

The CHAIRMAN. All right.

Dr. Krebs.

Dr. KREBS. In large measure, our process is very similar in the sense that when we receive—we try in our conversations with the Congress, whether it is expressed in law or through report language, to identify to the best of our ability what is intended. And in terms of working with the Congress, we acknowledge their guidance, and it—we inform them as to the impact on priorities which they may have some interest in, but then we generally take their advice.

The CHAIRMAN. Do either of you—neither of you have mentioned because it is a little indelicate, but do you feel that your actions are motivated by a sense that you might be exposed to retaliatory action by the Appropriations Committee? And please be honest with me about this.

Dr. KREBS. Well, I have to acknowledge that, you know, I have been in this position for a year and so I personally do not have a sense that I would experience retaliatory action. The experience of the Department over a period of time is not so clear to me. That is where I am—you know, my perspective on it.

The CHAIRMAN. All right.

Mr. Cannon——

Mr. CANNON. Mr. Chairman, I——

The CHAIRMAN [continuing]. Deep down in your soul do you ever fear retaliation from the Appropriations Committee if you neglect to carry out the wishes expressed even in a casual clarifying phone call from a staff member?

Mr. CANNON. Mr. Chairman, probably deep down in my soul I fear retaliation from many sources. But I believe—I have no personal knowledge of retaliation. But I think it is clear that the Agency and all the agencies believe it is in their interest to follow these directives.

The CHAIRMAN. Well, I think that is obvious.

All right. Let me ask you one additional question. Dr. Krebs, does your agency have the authority to fund research facilities, laboratories, et cetera, on universities—at universities giving title to these facilities to universities? Do you have that authority contained in law at any point?

Dr. KREBS. That is a hard question for me to answer in the sense that whether or not we have that contained in law. If you mean do we have that in authorizing language——

The CHAIRMAN. Correct.

Dr. KREBS. I am not aware whether we do or not. What I am aware of is that we do vest title to these entities——

The CHAIRMAN. I am well aware of that too. I want you to tell me, and if you need to get your staff to research it——

Dr. KREBS. I'll have to do that.

The CHAIRMAN [continuing]. What the basis in law is.

Dr. KREBS. I will do that.

[See Appendix A, Item 2a.]

The CHAIRMAN. Same question to you.

Mr. CANNON. Mr. Chairman, I think if I understand the question—let me repeat it and make sure I do understand it—is whether we would have under an authorized direction as to the scope or limits of our program the ability to change that unilaterally.

The CHAIRMAN. No. No. I want to know if you have by authority of law the authority to build laboratories, research facilities on university campuses or anyplace else and turn them over to the university.

I presume you have authority, as long as you get the money, to build laboratories for EPA. But I am asking you if you have the authority to build laboratories or other facilities on university campuses which become the property of the university.

Mr. CANNON. I think as a general matter no, but I would have to qualify that. There may be particular authorizations.

The CHAIRMAN. Would you find out and answer for me?

And I'll tell you why I am asking. This committee has sweated blood trying to get funding for authorized programs to build facilities in NSF, for example. We've never gotten them. Instead you two agencies fund the same facilities without authority in earmarks, and that doesn't make me very happy.

[The information follows:]

Question for Jonathan Cannon
From Chairman Brown
October 6, 1994

[Page 36, lines, 792-798]

Question:	Does your Agency have the authority to fund research facilities, laboratories, et cetera, on universities -- at universities, giving title to these facilities to universities? Do you have that authority contained in law at any point?
Answer:	EPA has no general authority to provide funding for these types of facilities and then to give title to them away. On one occasion however, Congress in our 1993 appropriations bill, directed the Agency to give title to a library to Oregon State University.

Dr. KREBS. Mr. Chairman, I am informed by staff it is my understanding, and we will have to provide you the particular cite in detail for the record, but it is my understanding that the Department has authority to build facilities on non-governmental property through the Energy Reorganization Act of 1974.

The CHAIRMAN. Give me the exact citation for it. The reason is I may just give up trying to get authority in NSF to build facilities which will be based on some peer reviewed process and just put the heat on you to spend a few hundred million more for this purpose.

You both know the size of the backlog for university research facilities.

Dr. KREBS. Right.

The CHAIRMAN. Why should I break my back trying to get that amount increased when you already, apparently, from your actions have the authority to do it?

Please provide me with those citations.

[See Appendix A, Item 2a.]

The CHAIRMAN. Mr. Boehlert.

Mr. BOEHLERT. Mr. Chairman, Dr. Krebs has an interesting comment in her testimony on page 4 when she says the Department carefully reviews Appropriations Acts as well as accompanying House, Senate and conference reports and the Congressional Record to identify academic earmarks.

I assume by that if you read in the Congressional Record that a particularly influential Member of Congress is interested in a given project, then you interpret that perhaps as an academic earmark.

Would you explain that statement?

Dr. KREBS. I think what we are looking at is the floor debate on various—on bills and to understand some of the background that may come up in terms of amendments on the floor.

Mr. BOEHLERT. Oh. Well, then that is good.

Mr. Chairman, I can solve your problem. Next time we have a floor debate we will enter into a colloquy, and you just tell the world through the floor debate what you would like, what your preference is, and we can forget peer review, we can forget merit. We just have your intentions and that will be interpreted as a go ahead sign.

The CHAIRMAN. Would the gentleman yield briefly?

Mr. BOEHLERT. Be glad to yield to the chairman.

The CHAIRMAN. If we can't solve this problem through the normal process, then that is my cue to begin earmarking. California has more appropriators than any other State. We have more full committee chairmen than any other State. We have a greater propensity or ability to earmark. And I am willing to engage in an earmarking competition with New York or Pennsylvania.

Mr. BOEHLERT. Well, it would be easy to do, Mr. Chairman—reclaiming my time. We don't even have to worry about getting any authorization from the committee or having any report language approved. All we have to do is get over to the floor and talk to each other about what you would like for California and what I would like for New York, and the devil be damned with any——

Mr. VOLKMER. Would the gentleman yield?

Mr. BOEHLERT. I'd be glad to yield to my colleague.

Mr. VOLKMER. You want to throw Missouri in there? [Laughter].

Mr. BOEHLERT. Let me ask, Mr. Cannon and Dr. Krebs, both of you, do your Departments ever verbally and in writing protest earmarks? Do you have any examples of where you have seen an earmark that you say internally after very thoughtful deliberation this is totally unacceptable and inconsistent with our program? Do you ever publicly so state?

I know that is a tough one.

Dr. KREBS. Well, let me—in the past, I have just been informed by Mrs. Smedley that in the past as a Department we have proposed rescissions.

Mr. BOEHLERT. Would you just repeat that? You have?

Dr. KREBS. We have proposed rescissions to the Congress.

Mr. BOEHLERT. Rescissions, yes.

Dr. KREBS. So, in terms of official recommendations and official communications to the Congress, yes, indeed we have made those comments in the past.

The CHAIRMAN. May I inquire as to whether specifically if those proposed rescissions were earmarked rescissions or other rescissions? You frequently propose rescissions of things that have been passed through the normal process and included in law.

Dr. KREBS. In the past we have proposed them to earmarks specifically.

The CHAIRMAN. Okay.

Mr. BOEHLERT. What I would, Dr. Krebs, for the record so that my colleagues would have the benefit of the wisdom of the Department, I would appreciate it if you would share in writing with us a couple of those examples as they deal specifically with earmarks.

[See Appendix A, Item 2b.]

Mr. BOEHLERT. Mr. Cannon, do you have anything to say——

Mr. CANNON. I don't know of any instances where we have publicly resisted earmarks. I do know that where there is consideration suggested by the appropriating committee, that is, where the earmark is the form requiring us to consider funding certain items, that we do take that as a discretionary matter and in some cases we have declined to take the appropriating committees up on that consideration. That is, we have considered as directed but we have determined not to fund the item.

Mr. BOEHLERT. I don't envy you your task. You have a very difficult assignment here. Knowing of the chairman's strong feelings on this subject, and I think strongly supported by this committee on a bipartisan basis, we sort of have the feeling—and I don't apologize for this. We sort of have the feeling that the American people would like our decisions to be merit-based. And when we are dealing with things that we don't quite understand or a lot of things we don't understand we have peer review. I mean that is sort of the American way of the 1990s.

And you have the unenviable task of justifying a lousy system.

Mr. Chairman, this is—we know how to proceed though. This is interesting. We know how to proceed, so I am looking forward to some of our future colloquies, if we don't change things around here.

The CHAIRMAN. Thank you.

Mr. BOEHLERT. Thank you very much.

The CHAIRMAN. Thank you very much, Mr. Boehlert.

Mr. Barca, do you have any questions?

Mr. BARCA. Perhaps I would just ask for a clarification from Mr. Cannon from an earlier statement. When you said that at times you get calls to clarify what the report language is, I guess, how common are those kinds of calls to clarify what report language is?

Mr. CANNON. I don't know whether I can give you sort of a quantitative estimate, but we do find not infrequently that the language in the report or in the appropriations bill is not clear as to what exactly is intended, and the colloquy is designed to elicit that.

In some cases it is determined that—the colloquies on the floor were mentioned previously. Sometimes the colloquies on the floor help elucidate the bill language or the report language and are useful in that regard. But where that is not the case further conversations with staff may be necessary.

Mr. BARCA. Have you gotten calls where there was no clarification requested at all, just strictly requesting that money be granted where there is no report language, where there is no colloquy, where there is no language anyplace, anywhere within the context of the debate or the report or the bill itself?

Mr. CANNON. I am not aware of those instances.

Mr. BARCA. To the best of your knowledge, those kinds of calls have never taken place?

Mr. CANNON. Not that I am aware of.

Mr. BARCA. How about for any of the other panelists?

Dr. KREBS. I have to work from personal, you know, the time that I have spent in the last year at the Department, and to my knowledge, if there is any ambiguity in the record as to location or process, the Department of Energy pursues and uses a peer review process, in my experience.

Mr. BARCA. Okay. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Mr. Barca.

Mr. Fawell?

Mr. FAWELL. Thank you, Mr. Chairman. Which I propose to follow through on the question, why Members of Congress make it site specific, very, very clear, and that is, I think, the essence of what earmarking is about.

Dr. KREBS. It does not always happen, though.

Mr. FAWELL. Sometimes we flub up on that?

I don't want to beat a dead horse on this. But when you do have town hall meetings back home and it is clear the report language is not binding, it may be helpful as you point out, and I am sure it is at times in gathering the total intent of the Congress.

But if it is not binding, people back home at least—I guess we understand how the world turns here—don't understand why there is such a compelling instinct to follow that. How would you advise that we can explain that to the people back home? Any easy way?

Dr. KREBS. I'm going to make a personal comment, Mr. Fawell.

Mr. FAWELL. Sure. And I don't mean to—I guess I'm putting you on the spot, but I don't——

Dr. KREBS. I know. I understand and this is kind of philosophical. I think that the Congress and the executive branch are engaged jointly in trying to figure out what are the right things for the government to do, and I look at what happens in appropriations and authorizing—the authorizing processes as part of their conversation, to the extent there are times when law is more binding than any of us might be comfortable with.

This doesn't help you with your constituents, but yes, I think it is part of the reason why utilizing the legislative record is sometimes an important tool to be able to use. In the case of academic earmarks, we find that we're in a situation where we've had a process that works very well for us in terms of providing excellence in terms of science, in terms of supporting institutions and bringing young people in, the next generation of scientists and engineers, and it has worked very, very well.

And what is particularly disturbing to any of us that have an investment in that is that this other process that is sometimes good overall and supports an appropriate kind of governance is set against that. And it is part of my job and some of the other people at this table to try and walk along the middle of that, as it is yours. And I don't have any good advice for you.

Mr. FAWELL. I understand. I guess somehow we have to make it clear that whether there is site specific instructions that no agency can feel that they should abandon the peer review process to determine what site ought to be used regardless of what Congress may throw in that report language, and we aren't able to do that at this point, human nature being what it is all over.

But I am more concerned, I guess, about whether or not this sort of a site specific earmark, for instance, may actually be carried so far that you have then detriment to peer review legislation.

I understand that the Department of Energy, for instance, has decided, allegedly arbitrarily, to cancel the $5 million of awards in Fiscal Year 1994 for the university research instrumentation program. And these funds for this competitive merit-based program, I am told, were explicitly requested by the Administration and explicitly appropriated by Congress.

I also understand that this funding was canceled in order to cover a $5 million earmark included in report language, and apparently this was all done without a formal reprogramming request to Congress.

I'd like to know if you do have knowledge of that. If not, we can be certainly advised upon your analysis. But if so, then the question is what is the rationale and justification for the Department's action and how can one justify diverting congressionally approved funds in this manner?

Dr. KREBS. I'm going to have to provide you with information on the record because I don't have personal knowledge of that.

Mr. FAWELL. Are you aware of other cases where that may have occurred?

Dr. KREBS. Not in such circumstances as you describe.

Mr. FAWELL. If you could look into that, because I have had several people speak to me on this and are concerned about it. They believe that this occurs, unfortunately, too often.

Thank you.

[See Appendix A, Item 2c.]

The CHAIRMAN. Thank you very much, Mr. Fawell.

Mr. Minge?

Mr. MINGE. Thank you, Mr. Chairman.

There are a number of issues that have already been adequately covered, and I agree with the chairman and applaud him for scheduling this hearing.

I'd like to take a different tack here in the discussion, and that has to do with a comment I've heard from several Members of Congress that the peer review process in this country has involved a certain amount of elitism and that there is a need for earmarking at the congressional level to offset or compensate for that.

And essentially what's being said is it is like an "old boy" network. If you have your degree from one of the major research universities in this country you sort of are on the inside track and you know the folks, whereas if you're teaching in an institution out in the Plains somewhere it is very difficult to break into this network, and therefore the earmarking affects that, or deals with that.

Would you comment on whether or not you find the peer review process suffers from that defect? And if so, if there is some way to correct for it so we get away from the "old boy" network process?

And I direct this question to each of the three of you.

Ms. GREENWOOD. I would be happy to answer that. I think the recent review of peer review by the GAO speaks specifically to that. Peer review, of course, in this country has a long history, and the composition of the peer review panels at the agencies that conduct peer review panels has changed substantially over time.

And, as this report points out, in its most recent incarnation the peer review panel tend to have individuals distributed across the country, they tend to have good representation of women. Perhaps not as much as one would like, but nonetheless, considerably more than it used to be. And that in fact the elite institutions as we have probably traditionally called them, and I would argue that the elite institution structure is also changing some, that the elite institutions are not overly represented on these review panels.

And let me just put in a point from my own perspective. I have been personally, before I took this job—I too have been in Washington only for a year—an investigator with steady Federal funding for 2½ decades going through the peer review process, and although I myself like every other scientist is always disappointed when an idea that I thought was brilliant is not judged to be quite as brilliant as I thought it was by my peers.

The way that we develop the ideas, the hypothesis testing that we're asked to do, the response of our peers to these experiments, the reiteration and the constant reiteration, the iterative process that goes on does encourage people to think very clearly and to focus their ideas and to set priorities in their research, and it causes study sections and peer review panels to think very carefully about the relative merits of very good proposals under very tough funding conditions.

And I want to point out to you right now that in the merit review process in the NIH and the NSF—I'm not quite as certain, I'm sorry to say, about some of the other agencies—we are only paying approved proposals for investigators, in some cases at the 15 percent—at the 15 percentage point, which means that 85 percent of the approved proposals, proposals that have taken years to develop, that have required the gathering of information, that have been reviewed and reviewed and reviewed are not going to be funded even under the best of circumstances.

So, I think under those circumstances, especially with these tight fiscal constraints, we have to be ever more vigilant about how we spend those dollars. I don't think at the level that we are talking about that one can argue that it is an "old boy" system rewarding money to the friends of the friends. I hope, at least I—it certainly wasn't my experience and I had a lot of it.

Mr. MINGE. Thank you.

Dr. KREBS. I'd like to second what Dr. Greenwood has said and put it briefly in the context of the Department of Energy. The Department of Energy is a mission agency. We put a lot of money in its basic research programs. We put a lot of money into research at national laboratories and to facilities at national laboratories, and into universities. And each of these investments receives peer review somewhat different depending on these different kinds of, you know, areas of investment.

We are very cognizant of the fact that our peer review process needs to pay attention to all institutions, to all performers, all different kinds of performers of research, and I think that if you were to look at our peer review process, although I have to say it is not validated in the same way as NSF's and NIH's process has been validated, that we too have broad representation on our peer review panels from both elite and non-elite institutions and from both—you know, all segments of the research performing population.

Mr. MINGE. Perhaps I could just add to my question because I expect that the third panelist will be agreeing with the first two. If I could add to my question or comment, what would happen if Congress were to say that the institutions in Massachusetts, New York and California could have no more than 25 or 30 percent of the Nation's peer review awarded grants? Would that be another way of sharpening this inquiry, which is another proposition I have heard from some Members of Congress?

Mr. CANNON. I would like to ask Dr. Huggett to respond to your question on behalf of EPA, if I may.

Dr. HUGGETT. Thank you. Relative to your add-on question, I think that by limiting peer review awards to a given segment of the country would be counterproductive to the very best science being done in the country.

I think we owe it to the citizens of this country and the citizens of the world to guarantee that we have the very best science.

Relative to the first part of your question, I just came from academia. I was a professor and I am on leave of absence from the College of William and Mary. I have been subjected to peer review for my academic career, over 25 years. I can tell you since William and Mary is considered by some a fairly decent school, we have people that fail peer review. So, it is not a "good old boy" or "good old girl" system.

In addition, before coming here I was a member of the Science Advisory Board of the Environmental Protection Agency, a peer review system or entity created by the Congress. And I was also a member of the Water Science and Technology Board of the National Research Council. So, I have some experience with peer review.

We are at this time revising our peer review process within the Office of Research and Development of EPA. We are working with the National Science Foundation and we have entered into an agreement with the National Research Council of the National Academy of Sciences to come up with the very best peer review based on our needs as well as their experience that we possibly can.

We intend to subject our internal research to peer review. As designed and—helped designed by them and approved by them, we intend to subject our extramural investigator competed peer review to that peer review process, and we intend to subject the academic earmarks to the same peer review.

The difference is the academic earmarks are not competed, and this is a very, very important difference, as the chairman pointed out. But they will be peer reviewed at the highest level.

We intend to increase our competitive research grants to academia and not-for-profit institutions within the next 3 years from approximately $22 million to $100 million a year. We intend to greatly advance our fellowship program for graduate degrees from a meager million or so dollars up to one that will have 300 graduate fellowships on the streets by 1997. These will be peer reviewed as well.

We hope for the students to actually submit proposals for their fellowships. I think one of the reasons we have academic earmarks is because there is not—in the case of environment, there is not a great deal of money out there through the normal channels. And, if we can eliminate that by expanding our grants program, expanding our fellowship program, this, although it won't satisfy it totally I will guarantee, but hopefully it will eliminate some of the pressure for these.

Mr. MINGE. Thank you.

The CHAIRMAN. Mr. Barca, did you have a follow-up question that you could make briefly?

Mr. BARCA. Yes, I do, Mr. Chairman. I want to follow up with the line of questioning I had heard earlier because I have a couple specific examples that I wanted to get a clarification in.

Last year, in fiscal year 1994 in the VA–HUD bill that was advanced there was language in there to do toxicological research, which makes perfect sense. They talked about having research areas that has adverse effects and long-term consequences of certain toxins and went on to describe those.

But to the best of our staff's research, we could find no reference whatsoever in any report language, in the substance of the bill itself, in any colloquy or anyplace else where those research funds should be directed.

However, on the bottom of one of the documents that we have received it said that there was later verbal instructions from Hill staff to direct these resources to the University of Arkansas, and I'd like to just get a clarification of why these resources would be directed in that manner then, since in this case there was no reference to that within the bill or report language.

Mr. CANNON. I will get—I don't have personal knowledge of that circumstance and we will supply additional information in response to the Congressman's interest. But from your discussion, my understanding is that that would have been the result of a discussion with staff seeking interpretation or clarification of the earmark in the language.

Mr. BARCA. Well, I guess what bothers me is just 10 minutes ago when I asked you the question if this sort of instance had ever occurred you had indicated that you didn't believe that this kind of instance ever did occur.

Mr. CANNON. I had a different understanding of your question. My understanding of your question was that apart from any language, report language or any other language, just out of the blue did these colloquies take place, and my knowledge is that they do not. This has support in the report language.

Mr. BARCA. All right. But the point is in this instance is that the report language dealt with doing toxicological research. There was nothing, to the best of our understanding, and this is where I would like clarification from you, because to the best of our staff's understanding there was no reference whatsoever in any report language or in the substance of the bill itself or in any colloquy or in any debate that took place on the floor that there should be resources directed, in this case to the University of Arkansas.

Mr. CANNON. I understand the nature of your question now, and we will supply additional information on the particular instance you raise. If you have others, we will——

Mr. BARCA. I have one other instance that maybe you can follow up on as well. This deals with research on environmental equity that was in the very same bill. And in this case beyond that there were verbal instructions given to direct resources to a consortium led by LSU.

Mr. CANNON. Yes. I mean that is a similar situation, the result of a colloquy.

Mr. BARCA. And here is a third instance. On air toxic metals research with verbal instructions to direct the resources to the University of North Dakota, so there would be just three instances that perhaps you could get back to our committee in writing.

[No information provided for the record.]

Mr. BARCA. But I guess the part that troubles me is that, you know, it would be one thing if we were dealing with clarification of some language that was in the report, or perhaps as you had indicated a colloquy on the floor, but as far as our staff has been able to determine in reviewing each of these documents we can find no reference whatsoever to any university for any reason whatsoever why your staff and why the EPA would not have concluded that there should be a merit review process.

And I guess that is the kind of detailed information that we would appreciate getting is what led you to conclude that there should not be a merit review process but rather you should just follow through with the communication that you had gotten to direct it to one particular institution.

Mr. CANNON. I understand the question and will make a response to you on that, and to the full committee.

Mr. BARCA. Thank you very much. And thank you, Mr. Chairman.

The CHAIRMAN. Mr. Cannon, I would like to indicate to you that our very diligent oversight staff is going to pursue as many more examples of this kind of thing as they can, and if you are to be really cautious you would try and identify any others that you can before we do and then ask you why you didn't tell us about them. So, I would recommend that to you.

Now, my recommendations do not have the influence of a member of the Appropriations Committee staff, but nevertheless we will try to take appropriate steps to assist you to remember to do that.

[No information provided for the record.]

The CHAIRMAN. Mr. Bartlett.

Mr. BARTLETT. Thank you. I spent a fair part of my life in the academic scientific community. I have something over a hundred papers in the scientific literature, many of them, most of them in the basic area, university level, medical schools, worked at NIH as a government contractor in such places as the Applied Physics Laboratory and IBM, and in my own company.

When I worked at NIH we noted then that the earmarking had a very venerable history, because all of the Institutes when I worked there were named after the diseases of old men who ran the Congress. There was a National Heart Institute. There was Arthritis and Metabolic Diseases with a conspicuous research program in gout.

Let me read—if you wonder how old earmarking is, let me read from Dr. Greenwood's comments and ask you if you all agree with her statement that because earmarking is not a competitive process for recipients, earmarking may result—I would think will result, in a generally lower quality scientific product.

She also says the practice of earmarking runs counter to the very process of research funding that has assured excellence in American science.

Do you all agree with those statements?

Dr. KREBS. Yes.

The CHAIRMAN. The answer is yes.

Dr. KREBS. Yes.

Mr. BARTLETT. Okay. [Laughter].

If earmarking is then generally agreed as not a desirable process, how do we stop it?

Ms. GREENWOOD. If I had the answer to that question I probably would not need to be sitting here. But let me do point out—I'd like to point out one thing, though, that hasn't been brought up in the discussion and I think is an important thing to put on the record, and that is that congressional earmarks are, of course, a direct derivative of the actions of Congress, but they are also a direct derivative of the actions of those who have the earmarks.

And I think that we need to carefully examine, and I understand you are doing this with your next panel, examine the motivations of the academic institutions that are hiring lobbyists or who on their own are finding ways to earmark the funding.

One of the reasons this is of particular concern to me is because it has the potential for dividing the academic community and the scientific community within itself, and if that happens it will really probably result in the phenomena of, you know, united we stand, divided we fall, very quickly.

It stand the potential of destroying the process. If the academic institutions in which this work is done do not believe that the process is worth continuing, then I think we're going to have continuing pressure on congressional members to earmark into their districts.

So, I think we—we have to understand that it is not just a congressional problem, it is not just an executive branch problem, it is also a constituency problem. And I'm sure some of my colleagues will be not very happy with what I have just said, but nonetheless, I think it needs to be on the record that we, and one of the things that the Administration is doing in its informal discussions is talking about the problems that are created by the process of academic earmarking and the long-term potential difficulties that is going to cause us in a tight budgeting problem.

Mr. BARTLETT. You have made some very laudatory general statements about earmarking. Does the Administration anticipate a specific policy statement rather than the general kinds of statements? Gee! This is probably not the best way to do it.

Ms. GREENWOOD. We've certainly been on record as saying that we think earmarking is destructive of the overall process. We have not, I must say, been any more capable of a single solution for solving the earmarking problem.

As I said in my testimony, and I believe it is true, we need to address the issues of access and excellence so that we have a fair system around the country and we ensure that people of different research—different research performers, people of different backgrounds, institutions and different regional areas do have access to the competition for funds, and a fair and equitable access.

But to have a specific policy that specifically targets earmarking, ours has been more trying to find the solutions by providing other incentives to encourage other behaviors.

Mr. BARTLETT. So long as a major part of our research dollars use the government as a conduit, do you think that since Congress persons seem to feel the need to bring resources back to their districts, do you think that as long as we have this major mechanism for funding research that earmarking—that the solution of earmarking is, in fact, possible?

Ms. GREENWOOD. Well, I haven't lost faith that we all want the same excellence for the country and its research product, and I haven't lost faith in the ability of the scientists in this country to help us distinguish what the most meritorious products are, and so I guess the answer to your question is I hope we can find a solution.

Mr. BARTLETT. Just one final comment and question. My first research papers were in the late forties and they spread over a number of years, so I have had a lot of years to think about this.

I am not convinced that government is the best conduit for funds for research. Funneling money through the government does not create more dollars. As a matter of fact, it dissipates dollars in the bureaucracy that allocates the dollars to research.

Having said that, I will admit that the National Institutes of Health and some other institutions have a remarkably good history, largely because peer review has been a major factor in how the funds are distributed. But I'm wondering if there is not a role of government in providing the right kind of climate in our country so that increasing dollars can go to research other than being confiscated by the government and then allocated for research.

That is all of my questions, sir.

The CHAIRMAN. Thank you very much, Dr. Bartlett.

I'm going to—we have 10 minutes before we have to run, so each of you are going to get 5 minutes.

Ms. Harman?

Ms. HARMAN. Thank you, Mr. Chairman. I'm here to show my solidarity with you on this issue, which is a very tough issue, and also to note for the record that this morning Chairman George Brown was named as chair of the California delegation, which he has pointed out contains more committee chairs and more——

The CHAIRMAN. Members of the Appropriations Committees.

Ms. HARMAN [continuing]. Members of the Appropriations Committee—thank you, sir—than any other delegation in the Congress.

I am here to show my solidarity because earmarks are bad policy. I'm also here to show my great respect for you who could easily steer many earmarks to your district for your courageous stand against them. It is noted, and it is having a big impact on this Congress that you are standing up and saying these things.

We should have learned, I believe, from the enormous outcry on the crime bill how badly earmarks play out in our districts. I don't think they are defensible, much as I would like a few projects in my district. But I'm prepared to have them competing on the merits and to go through a rigorous peer review process.

I really don't have any questions today, except to say that by your courage and by your example I believe that you will achieve this result over time. But I also applaud the fact that you are not afraid as a committee chair to stand for this principle.

Thank you very much.

The CHAIRMAN. Thank you very much, Ms. Harman.

Mr. Inslee?

Mr. INSLEE. Thank you, Mr. Chair.

We are talking about forces that might be arrayed to reduce earmarking. The chair of this committee is one of them. Your agencies are several more.

I guess what I would like to ask is whether or not there has been consideration of some fundamental strategy to draw some line in the sand, implicit or explicit of a certain percentage of report language that is going to be contested, if you will, by the agency in the next year; i.e., recognizing this is not a dragon that will be slain overnight but incrementally.

Have the agencies considered that for report language which is not legally binding on the committee, I think we all should agree on that, to say there is a certain percentage that the agency is going to contest? Is that under consideration at all?

Dr. KREBS. To my knowledge, within the Department of Energy that is not the case.

Mr. CANNON. That is also the case of EPA.

I would say, and this is a point and it's not directly responsive to your question, but I think it is one of the things we can do working with you all, a point that Dr. Greenwood made early on in her testimony—I think to the extent that we can improve science in our respective agencies, to the extent that it becomes recognized as high quality science with a strong rationale dictating priorities and accomplishments that we can all be proud of that we do strengthen our ability to resist earmarks and we do reduce the temptation, I believe, to impose them.

And I think that is a secondary benefit of a good science program, and I am hopeful, and EPA and Dr. Huggett is going to be working on this, that that will have some benefits.

Mr. INSLEE. Thank you.

The CHAIRMAN. Are there any other members who have not had questions? If not, I'm going to take a second shot at you.

In line with the statement that you just made, Mr. Cannon, about the improving of science in EPA, I received a letter from the Secretary of Energy a few months ago asking my approval for reprogramming funds from certain authorized research programs and to fund—to support earmarks, and in that letter I suggested that it would be desirable that the Department of Energy have a process for reviewing earmarks to determine if they comported with the agency's mission and have an adequate quality of excellence about them to merit funding.

I asked for a response within six weeks, which I thought would be sufficient, and I have not received such a response. In fact, I haven't been able to find out who has my letter.

I'm going to ask you, Dr. Krebs, to carry back to the Department my very strong feelings that, while I am not a staff member of the Appropriations Committee, I think it might be appropriate to respond to my letters when they speak to an issue of this importance.

Dr. KREBS. I will, Mr. Chairman.

The CHAIRMAN. Would you do that?

Dr. KREBS. Yes, sir.

The CHAIRMAN. In addition to that, I have here in my hot little hand a number of memos from the Department of Energy indicating precisely where they have cut funds for authorized programs in order to fund earmarks. I'm going to put this in the record. I'm going to suggest that you look at it very carefully, and I'm going to notify every member who I can identify who has a program that was cut in order to fund the earmarks that such was the case.

And I'm going to suggest that you and the Department might consider doing that also.

[The list follows:]

TO: CHAIRMAN BROWN
FROM: DAN PEARSON
SUBJECT: RESEARCH AT DOE CROWDED OUT BY EARMARKS
DATE: SEPTEMBER 21, 1994

Staff have made ongoing requests to the Department of Energy for information on how the approximately $30 million in FY 1994 earmarks were absorbed by the Department.

The attached documents show the efforts by first Biological and Environmental Research (BER) and then other divisions to specify how they absorbed cuts to their research which resulted from earmarks. BER's cuts largely impacted global climate change and human genome work. Cuts were spread through a variety of universities and across the national labs. Among institutions hurt by these cuts were:

Columbia University
University of Illinois
State University of New York, Albany
Duke University
University of New Hampshire
Harvard University
San Diego State University
UCLA
Kansas State University
Lawrence Livermore
Sandia
Los Alamos

Other divisions were less specific in where the impact of their cuts were felt. Rather, they focused on the kind of research which was postponed. These research initiatives include, among others: delayed decommissioning and decontamination activities for DOE non-defense sites, a reduction in experimental activities for the NOVA laser was implemented (with an impact on Lawrence Livermore and Los Alamos), and a delay in advanced battery development work.

Note that one piece of information provided to the Committee regarding BER cuts was in error. The corrected information was provided on September 9. In deference to the privacy of the researchers who were improperly identified in the original information sheet, we have edited the August 1 memo to reflect the updated data.

Attachments

Department of Energy
Washington, DC 20585

July 21, 1994

Note to: Dan Pearson, Staff Director
Subcommittee on Investigations and Oversight
House Science, Space and Technology Committee

Subject: Follow up items from meeting on July 18, 1994

Attached are the follow up materials requested by Committee staff from the meeting discussing the Department's reprogramming letter of March 9, 1994 and Congressionally directed activities. The reprogramming of $2.4 million in the Basic Energy Sciences will move funds from capital equipment into operating expenses.

Please let me know if our office can be of further assistance.

Mia Anderson

Mia Anderson
External Coordination Staff
Office of Budget
586-4176

BER Program Impacts Due to Funding
$15.4 million of Congressional Earmarks in FY 1994

A. $12,997,000 MILLION FROM OPERATING EXPENSES

Activity	Reduction($K)	Impact
Biological Research	852	Planned expansions of research into comparative DNA analyses for evaluating individual variations in susceptibility to environmental agents was not initiated and selected projects were reduced.
Structural Biology	489	Planned expansion of staff support for user facilities at the National Synchrotron Light Source (NSLS), BNL was deferred.
Molecular Biology	1,523	Several projects were eliminated or reduced at BNL, LANL, LLNL, ORNL, and universities to accommodate the reduced budget level. This impacted research into the molecular mechanisms of DNA damage, repair, and replication, and curtailed research to develop markers of exposure.
Cellular Biology	211	Delayed expansion of cellular research at BNL and LLNL to better define scientific uncertainties associated with risk from exposure to environmental agents.
Genome	1,491	Significantly slowed development and implementation of new sequencing technologies and pilot sequencing projects that are crucial to meet the goals of the genome project.
Medical Applications	1,910	Deferred start of a new molecular nuclear medicine thrust to couple advances in genetic technology with nuclear medicine for in vivo imaging at the molecular level.

Activity	Reduction($K)	Impact
Atmospheric Sciences	725	Eliminated funds for the International Global Atmosphere Chemistry program. This delayed the analysis of the 1993 field experiment results and eliminated a preliminary 1994 summer field experiment. The data are used to understand atmospheric chemistry issues relevant to global aerosol effects on climate and the pollutants related to energy production and use, e.g., natural gas use.
Ocean Margins Program	260	Decreased the level of effort of instrument development. This may result in a decreased ability to predict how much carbon dioxide is prevented from recycling to the upper ocean and to the atmosphere.
Subsurface Science	693	Delayed the start of high-priority research in microbial heterogeneity which supports DOE's plans to increase knowledge about the physical, chemical, and microbiological processes that affect contaminant transformation in the subsurface, and new remediation concepts; postponed research into microbial heterogeneity in humid eastern sites.
Microbial Genome	1,100	Reduction postponed start up of this very promising project until FY 1995. This places the United States one year behind Japan and the EC in their push to completely sequence the genome of a life form.
Program for Ecosystem Research	240	The reduction made it more difficult to secure a fully integrated program by deferring support of several interrelated projects.

Activity	Reduction($K)	Impact
Carbon Dioxide	3,503	
• Carbon Cycle and Vegetation Research	(1,549)	Level of effort to quantify carbon dioxide sources and sinks in relation to land-use change was reduced by three projects (259K) at Duke, the University of Illinois, and the State University of New York, representing about 25% of the DOE program in this area. Funding for about $1290K in grants to seven universities and two interagency agreements due for annual renewal in mid to late September will be deferred to FY 1995.
• Global Change	(1,954)	All reductions were taken from planned growth, which delayed the implementation of the second ARM site on the Alaskan North Slope as equipment orders will be delayed. Planning for the third in the tropical Western Pacific site will also be delayed. The Science Team will be reduced, delaying input to the Global Change Program's highest priority, clouds and radiation.

B. $2,403,000 MILLION FROM CAPITAL EQUIPMENT

Capital Equipment	$K	Impact
Structural Biology	680	These funds would have been utilized at the Brookhaven National Laboratory to upgrade beamline X-25 at the (NSLS) for structural biology studies and to upgrade the protein crystallography station at the High Flux Beam Reactor. Beamline X-25 at the NSLS has perhaps the only tunable wiggler in the world and will be an important resource for conducting multiwavelength anomalous dispersion studies of protein crystals. It was decided that, given the budget constraints, these upgrades could be deferred.

Capital Equipment	$K	Impact
Genome	260	These funds would have been utilized by the Los Alamos National Laboratory to upgrade equipment needed for automation of molecular biological operations conducted during high-throughout mapping of the human genome. It was decided that, given the budget constraints, the upgrade could be postponed for a year.
Global	908	These funds would have been used at PNL to provide equipment for the tropical Western Pacific and Alaskan northern slope ARM sites.
Medical Applications	155	These funds were to contribute towards purchasing a $450K SPECT instrument for the BNL Imaging Center.
Health Effects and Atmospheric Sciences	400	These funds were to contribute to replacing aging equipment across each program area at most laboratories.

Department of Energy
Washington, DC 20585

July 28, 1994

Note to: Dan Pearson, Staff Director
Subcommittee on Investigations and Oversight
House Science, Space and Technology Committee

Subject: Additional information on the Department's BER Reprogramming

As you requested, attached is a summary of the Basic Energy Research program impacts to the $15.4 million from congressionally directed projects in Fiscal Year 1994.

Please call our office if we can be of further assistance.

Mia Anderson

Mia Anderson
External Coordination Staff
Office of Budget
586-4176

BER Program Impacts Due to Funding $15,400,000 of Congressional Earmarks in FY 1994

A. $12,997,000 FROM OPERATING EXPENSES

Activity/Reduction	Impact
Biological Research/$852,000	Planned expansion of research to be conducted at DOE Laboratories ($350,000) and in academia ($150,000) for comparative DNA analyses for evaluating individual variations in susceptibility to environmental agents was not initiated and selected projects were reduced at ANL and the University of Texas ($352,000).
Structural Biology/$489,000	Planned expansion of staff support for user facilities at the National Synchrotron Light Source (NSLS), BNL was deferred.
Molecular Biology/$1,523,000	Ongoing projects at BNL, LANL, LLNL, and ORNL were reduced by $463,000 to accommodate the decreased budget level. This impacted research on the molecular mechanisms of DNA damage, repair, and replication, and curtailed research to develop markers of exposure. The shortfall also delayed the initiation of the microbial genome initiative in the private sector due to a reduction of $1,060,000 designated for this effort. This places the United States one year behind Japan and the European Community in their push to completely sequence the genome of a life form.
Cellular Biology/$211,000	Delayed expansion of cellular research at BNL and LLNL to better define scientific uncertainties associated with risk from exposure to environmental agents.
Genome/$1,491,000	Significantly slowed development and implementation of new sequencing technologies and pilot sequencing projects that are crucial to meet the goals of the Human Genome Project, impacting primarily programs at BNL, LANL, LBL, LLNL, and ORNL.
Med Applications/$1,910,000	Deferred start of a new molecular nuclear medicine thrust to couple advances in genetic technology with nuclear medicine for in vivo imaging at the molecular level. Project participation for competitive funding was expected both from the National Laboratories (e.g., BNL, LBL, ORNL, LANL, and PNL) and from many academic centers (e.g., University of California Los Angeles, University of Michigan, University of Chicago, and Memorial Sloan Kettering) with anticipated allocation of approximately 25 percent funds at the National Laboratories in FY 1994.

Activity/Reduction	Impact
Atmospheric Sciences/$725,000	Eliminated funds to ANL, BNL, PNL, and the university community for participation in the International Global Atmosphere Chemistry program. This delayed the analysis of the 1993 field experiment results and eliminated a preliminary 1994 summer field experiment. The data are used to understand atmospheric chemistry issues relevant to global aerosol effects on climate and the pollutants related to energy production and use, e.g., natural gas use.
Ocean Margins Prg/$260,000	Decreased the level of effort of instrument development at Woods Hole Oceanographic Institution and Monterey Bay Aquarium Research Institute. This may result in a decreased ability to predict how much carbon dioxide is prevented from recycling from the upper ocean and to the atmosphere.
Subsurface Science/$693,000	Delayed the start of high-priority research in microbial heterogeneity at ORNL and PNL, which supports DOE's plans to increase knowledge about the physical, chemical, and microbiological processes that affect contaminant transformation in the subsurface, and new remediation concepts. Postponed research into microbial heterogeneity in humid eastern sites.
Microbial Genome/$1,100,000	Postponed projects until FY 1995 to support new approaches for bioremediation by the private sector.
Prg for Ecosystem/$240,000	The reduction made it more difficult to execute a fully research integrated program by deferring support of several interrelated projects at Woods Hole Biological Laboratory.
Carbon Dioxide/$3,503,000	
• Carbon Cycle Vegetation Research/$1,549,000	Level of effort to quantify carbon dioxide sources and sinks in relation to land-use change was reduced by three projects at Duke, the University of Illinois, and the State University of New York, representing about 25 percent of the DOE program in this area ($259,000). Funding for about $1,290,000 in grants to nine universities, a research center, and two interagency agreements due for annual renewal in mid to late September will be deferred to October 1, FY 1995.
• Global Change/$1,954,000	All reductions were taken from planned growth, which delayed the implementation of the second ARM site on the Alaskan North Slope as equipment orders will be delayed. Planning for the third site in the tropical Western Pacific will also

Activity/Reduction	Impact
• Global Change	be delayed. The Science Team will be reduced, delaying input to the Global Change Program's highest priority, clouds and radiation research. Institutions affected include ANL, LLNL, PNL, Sandia National Laboratory, seven universities, three other agency research centers, and a private sector institution.

B. $2,403,000 MILLION FROM CAPITAL EQUIPMENT

Capital Equipment	Impact
Structural Biology/$680,000	These funds would have been utilized at the BNL to upgrade beamline X-25 at the (NSLS) for structural biology studies and to upgrade the protein crystallography station at the High Flux Beam Reactor. Beamline X-25 at the NSLS has perhaps the only tunable wiggler in the world and will be an important resource for conducting multi-wavelength anomalous dispersion studies of protein crystals.
Genome/$260,000	These funds would have been utilized by the LANL to upgrade equipment needed for automation of molecular biology operations conducted during high-throughput mapping of the human genome. It was decided that, given the budget constraints, the upgrade could be postponed for a year.
Global/$908,000	These funds would have been used at PNL to provide equipment for the tropical Western Pacific and Alaskan northern slope ARM sites.
Med Applications/$155,000	These funds were to contribute towards purchasing a $450,000 SPECT instrument for the expanding BNL imaging capability.
Health Effects/ Atmospheric Sciences/$400,000	These funds were to contribute to and replace equipment across each program area at most laboratories.

TO: ARISTIDES PATRINOS
FROM: DAN PEARSON
SUBJECT: CLARIFICATION OF INFORMATION PRESENTED TO SS&T ON RESEARCH CUTS
DATE: JULY 29, 1994

Thank you for pulling together the information from BER that we had asked for. However, we want a little more detail than is presented in this format and I have some questions that arise from having two different lists of research cuts--one dated July 21 and the other dated July 28. To make it clear, I have written out specific questions that we would appreciate getting answers on. Thanks.

1. Molecular Biology is cut by $1.5 million. In the July 21 report you indicate projects were eliminated or reduced at several universities. The July 28 report does not clarify which schools or private sector labs (if any) saw their research eliminated or reduced. Please provide detailed information on these institutions (names of schools, researchers, size of cuts).

2. Microbial Genome cut by $1.1 million. The July 21 report indicated that the impact of this cut was to place the U.S. a year behind researchers in Japan and Europe. The July 28 report is silent on that point. What impact will this have on the relative progress of U.S. research versus that in Europe and Japan? Was the July 21 letter accurate on this point?

3. Carbon Cycle Vegetation research cut by $1.549 million. The second paragraph in the July 28 report indicates that grants to nine schools and two research centers have been cut. Please provide information on these schools and centers (names of insitutions, researchers, size of cuts).

4. Global Change cut by $1.95 million. The July 28 report mentions that these cuts will affect seven universities, three other agency reseach centers, and a private sector institution. Please provide details on the cuts at those institutions (names of institutions, researchers, size of cuts).

I can be reached at 202-225-4494 if you have any questions. My fax number is 202-225-3895.

Department of Energy
Washington, DC 20585

DATE: August 1, 1994

MEMO TO: Dan Pearson
Subcommittee on Investigations and Oversight

FROM: Ari Patrinos
Office of Health and Environmental Research

SUBJECT: Clarification of Information Presented to SS&T on Research Cuts

Attached is the information you requested in your memo dated July 29, 1994, subject above. If you have any questions, please call me at 301-903-3251.

Attachment

RE: BER Program Impacts Due to Funding--$15,400,000 of Congressional Earmarks in FY 1994

Activity

Question #1
Molecular Biology

Clarification of University Impacts for Question 1:

Funding for continuing the project of C. Lawrence, University of Rochester, was projected in the FY 1994 BER budget for molecular biology. It was released to fund the Congressional earmark since Dr. Lawrence did not request a renewal of his grant. Such funds would otherwise have been used to fund requests for other biological research submissions which met the criteria for scientific merit and programmatic relevance. For example, a project by Dr. M. Karin, University of California, San Diego, received $81,053 less than his request, despite excellent peer reviews. Three other ongoing projects did not receive their requested support level, despite their excellent performance and promise. These were Drs. L. Prakash, University of Texas ($24,753); F. Perera, Columbia University ($15,000); and C. Saltini, University of Modena, Italy ($19,620), for a total of $140,426. Dr. Hays's project at University of California, Los Angeles was indeed terminated due to poor performance and should not have been cited.

Question #2 Microbial Genome	1,060	In addition, funds for initiation of the Microbial Genome Project were reduced by $1,060K. In compiling the July 28 report, information on the Microbial Genome reduction was inadvertently omitted. Microbes which live in extreme environmental conditions are expected to have numerous applications in biotechnology. The Japanese government announced last year an initiative to investigate the genomes of such microbes and they are also the subject of considerable research in Europe. This new DOE initiative is the only significant effort to be mounted in this country.

Question #3
Carbon Cycle Vegetation

Universities	$K
Columbia University/Broecker	50
University of Illinois/Brown	83
State University of New York, Albany/Hall	83
Duke University/Richards	83
University of New Hampshire/Moore	91
Harvard University/Bazzaz	100
San Diego State University/Oechel	190
University of California, Los Angeles/Nobel	104
Kansas State University/Owensby	216
Interagency Agreements	
National Aeronautics & Space Administration/Fung	91
U. S. Dept of Agriculture/Knipling	178
Other Institutions	
Woods Hole Research Center/Houghton	191
Increment not awarded	89
TOTAL	1549

Question #4
Global Change

AER, Inc./Clough, Louis	155
Argonne National Lab./Coulter	266
Lawrence Livermore National Lab./Bradley, Penner	183
NASA Goddard Institute Sp.Studies/DelGenio, Lacis	52
NASA Goddard Space Flight Center/Melfi	40
National Center for Atmos. Res./Kiehl, Dabberdt-Parsons	121
Pacific Northwest Lab./Ghan, Doran, Whiteman	290
Sandia National Lab./Kegelmeyer, Goldsmith	92
Colorado State Univ./Cotton, Gray	61
Penn State Univ./Ackerman, Young	390
State Univ. of New York/Michalsky, Wang	39
Univ. of Maryland/Ellingson	64
Univ. of Utah/Sassen	45
Univ. California San Diego/Ramanathan, Somerville	40
Univ. California Santa Barbara/Gautier	116
TOTAL	1,954

Environmental Management

$3.5M for University Research in Robotics

- $1.75 M Waste Management (Non-Defense) - Implementation plans for the development of a Treatment and Storage Planning document was postponed.

- $1.75 M Environmental Restoration (Non-Defense) - Some Decommissioning and Decontamination activities were delayed for non-defense DOE facilities and sites.

Defense Programs

$1.198 M for OMEGA laser upgrade at Rochester University

- The funding levels for the Inertial Confinement Fusion Indirect Drive program at Lawrence Livermore National Laboratory and Los Alamos National Laboratory were reduced. Specifically, the level of experimental activities on the NOVA laser were reduced and the achievement of milestones outlined in the NOVA Technical Contract were delayed.

Energy Efficiency

$306K Seasonal Thermal Storage Program - University of Alabama

- Delayed research into Advanced Battery Development and Storage Modules

$500K Research by Southeast and Southwest Regional Photovoltaic Experiment Station

- Funds to support this initiative were derived from a pro-rata distribution reduction against all Photovoltaic programs (Total FY 1994 PV budget $78M).

$300K Geothermal Direct Heat Utilization Assistance Program - Oregon Institute of Technology

- Supporting this effort necessitated a several month delay in initiating a joint venture with industry on exploration for new geothermal resources.

$147K Conversion of Biomass to Electricity - Hawaii Natural Energy Institute

- Deferred funding an additional Letter of Interest related to implementing a study for commercializing full-scale biomass projects.

BER Program Impacts Due to Funding $15,400,000 of Congressional Earmarks in FY 1994 From Operating Expenses

Activity/Reduction	Impact
Biological Research/$852,000	Planned expansion of research to be conducted at DOE Laboratories ($350,000) and in academia ($150,000) for comparative DNA analyses for evaluating individual variations in susceptibility to environmental agents was not initiated and selected projects were reduced at ANL and the University of Texas ($352,000).
Structural Biology/$489,000	Planned expansion of staff support for user facilities at the National Synchrotron Light Source (NSLS), BNL was deferred.
Molecular Biology/$1,523,000	Ongoing projects at BNL, LANL, LLNL, and ORNL were reduced by $463,000 to accommodate the decreased budget level. This impacted research on the molecular mechanisms of DNA damage, repair, and replication, and curtailed research to develop markers of exposure. The shortfall also delayed the initiation of the microbial genome initiative in the private sector due to a reduction of $1,060,000 designated for this effort. This places the United States one year behind Japan and the European Community in their push to completely sequence the genome of a life form.
Cellular Biology/$211,000	Delayed expansion of cellular research at BNL and LLNL to better define scientific uncertainties associated with risk from exposure to environmental agents.
Genome/$1,491,000	Significantly slowed development and implementation of new sequencing technologies and pilot sequencing projects that are crucial to meet the goals of the Human Genome Project, impacting primarily programs at BNL, LANL, LBL, LLNL, and ORNL.
Med Applications/$1,910,000	Deferred start of a new molecular nuclear medicine thrust to couple advances in genetic technology with nuclear medicine for in vivo imaging at the molecular level. Project participation for competitive funding was expected both from the National Laboratories (e.g., BNL, LBL, ORNL, LANL, and PNL) and from many academic centers (e.g., University of California Los Angeles, University of Michigan, University of Chicago, and Memorial Sloan Kettering) with anticipated allocation of approximately 25 percent funds at the National Laboratories in FY 1994.

Activity/Reduction	Impact
Atmospheric Sciences/$725,000	Eliminated funds to ANL, BNL, PNL, and the university community for participation in the International Global Atmosphere Chemistry program. This delayed the analysis of the 1993 field experiment results and eliminated a preliminary 1994 summer field experiment. The data are used to understand atmospheric chemistry issues relevant to global aerosol effects on climate and the pollutants related to energy production and use, e.g., natural gas use.
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Microbial Genome/$1,100,000	Postponed projects until FY 1995 to support new approaches for bioremediation by the private sector.
Prg for Ecosystem/$240,000	The reduction made it more difficult to execute a fully research integrated program by deferring support of several interrelated projects at Woods Hole Biological Laboratory.
Carbon Dioxide/$3,503,000	
• Carbon Cycle Vegetation Research/$1,549,000	Level of effort to quantify carbon dioxide sources and sinks in relation to land-use change was reduced by three projects at Duke, the University of Illinois, and the State University of New York, representing about 25 percent of the DOE program in this area ($259,000). Funding for about $1,290,000 in grants to nine universities, a research center, and two interagency agreements due for annual renewal in mid to late September will be deferred to October 1, FY 1995.
• Global Change/$1,954,000	All reductions were taken from planned growth, which delayed the implementation of the second ARM site on the Alaskan North Slope as equipment orders will be delayed. Planning for the third site in the tropical Western Pacific will also

Activity/Reduction	Impact
• Global Change	be delayed. The Science Team will be reduced, delaying input to the Global Change Program's highest priority, clouds and radiation research. Institutions affected include ANL, LLNL, PNL, Sandia National Laboratory, seven universities, three other agency research centers, and a private sector institution.
Radiation Studies/$500,000	Reduced "radiation studies" funding provided to EH (funds not needed by EH).
Genome/$201,000	Reduce research funds at LANL.
Structural/$680,000	Cancel UCLA grant in Structural Biology Program.
Global Change/$908,000	Defer Ecosystem Research initiative.
Base Research/$114,000	Reduced level of effort in Base Research program.

Activity/Reduction	Impact
· Global Change . . .	be delayed. The Science Team will be reduced, delaying input to the Global Change Program's highest priority, clouds and radiation research. Institutions affected include ANL, LLNL, PNL, Sandia National Laboratory, seven universities, three other agency research centers, and a private sector institution.
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Structural/$680,000	Cancel UCLA grant in Structural Biology Program.
Global Change/$908,000	Defer Ecosystem Research initiative.
Base Research/$114,000	Reduced level of effort in Base Research program.

The CHAIRMAN. And lastly, to Dr. Greenwood, I have suggested to the Administration that it wouldn't be too really difficult for them to instruct the department heads not to honor earmarks contained in report language, which are not legally binding, unless they met the Administration's priorities and the Administration's standards of excellence.

I have not received a very positive response to that action. Now, I understand that the Administration doesn't like to alienate powerful members of the Appropriations Committee either. They would much prefer that I do it and make all of them enemies. And I understand that.

But I'm going to ask you to see if you could share a little of that burden with me.

And with that, I want to thank you very much for your attendance. I assure you it will be spiritually good for you to have been here, and we will look forward to following up with each of you on these matters.

You are excused.

I'm going to call a short recess while we go answer this roll call and then the second panel will be called up for a similarly spiritually enlightening session.

Dr. KREBS. Mr. Chairman, we applaud you, too.

The CHAIRMAN. Thank you very much.

[Recess].

The CHAIRMAN. The committee will resume its sitting. And I will talk into the microphone.

We now have before us a panel of representatives from three very distinguished universities, and we appreciate their showing up. Despite what I said before to the earlier panel, we are going to be very general with you, and we have high regard for you. I have read the testimony of some of you, and it is excellent testimony and we appreciate that.

For the purposes of making an introduction, I would like to recognize our distinguished Member from Oregon, Congresswoman Furse, to introduce the witness from Oregon.

Your mike needs to be on.

Ms. FURSE. There we are. All right. Thank you, Mr. Chairman.

It is an honor to be here and it is my pleasure to introduce Dr. Joseph Bloom. He is the Dean of the School of Medicine of Oregon Health Sciences University, and that is a great university located in my district.

Dr. Bloom's career spans several decades with the past 2 decades dedicated to research and academic work at OHSU, as a member of both the faculty and the administration. His research career has brought him international recognition. He is an expert in community and forensic psychiatry.

He has served in leadership positions with several State and national associations, and he is also on the editorial boards of several scholarly psychiatric journals.

Dr. Bloom's leadership and direction at the School of Medicine has helped OHSU further its national reputation for excellence in research and education in health sciences. And I'm also honored to call Dr. Bloom a friend for many, many years.

Thank you, Mr. Chairman, for allowing me to introduce him.

The CHAIRMAN. It is, of course, a pleasure. I would like to invite you, to the degree that you have the time, to sit up here and watch us carefully so we don't do anything to hurt Dr. Bloom's feelings.

Ms. FURSE. Thank you, Mr. Chairman. I'll be here watching.

The CHAIRMAN. All right. The other two members, unfortunately, you don't have your Congressmen here. I would recognize them. But your autobiographical material will be appearing in the record.

Dr. William Ihlanfeldt is Vice President for Institutional Relations and Chairman of Research Park, Inc., of Northwestern University. And I again commend you for your testimony because I read it last night and it was excellent.

And Dr. Carol Aschenbrener, Chancellor of the University of Nebraska Medical Center.

I'm going to ask you to proceed in the order in which I have you listed, which is Dr. William Ihlanfeldt first.

STATEMENTS OF WILLIAM IHLANFELDT, Ph.D., VICE PRESIDENT FOR INSTITUTIONAL RELATIONS AND CHAIRMAN OF RESEARCH PARK, INC., NORTHWESTERN UNIVERSITY, EVANSTON, IL; JOSEPH D. BLOOM, Ph.D., DEAN, SCHOOL OF MEDICINE, OREGON HEALTH SCIENCES UNIVERSITY, PORTLAND, OR; CAROL A. ASCHENBRENER, Ph.D., CHANCELLOR, UNIVERSITY OF NEBRASKA MEDICAL CENTER, LINCOLN, NE

Dr. IHLANFELDT.[1] Mr. Chairman, my name is Bill Ihlanfeldt. I am Northwestern University's Vice President for Institutional Relations, which is the office responsible for government and community relations, and chairman of the board of directors for Research Park, Inc., which is in charge of the overall development and management for the Northwestern University-Evanston Research Park, a joint venture with the city of Evanston.

Mr. Chairman, I am pleased to have the opportunity to testify before the distinguished committee about the Basic Industry Research Laboratory, referred to as BIRL, and the Biotechnology Center facilities and relationships to an innovative, 2-part economic development project, establishment of the Research Park as a joint venture with the city, and construction or modernization of related research facilities on campus.

Northwestern is a major research university. In FY 1994 Northwestern received a total of $168 million in external awards for sponsored programs, and had a total operating budget of $678 million in expenditures.

During the recession of the early 1980's Northwestern was encouraged by Illinois political and community leaders to employ its research resources in order to revitalize traditional manufacturing and stimulate economic development. However, many of the university research facilities were outmoded for the conduct of modern science and already utilized beyond capacity.

Because no Federal programs were available to address this need for academic facilities, Northwestern petitioned Congress to fund construction not only of the BIRL and Biotechnology Center facilities, but also the material science facility on the campus.

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[1] Dr. Ihlanfeldt requested changes to his testimony, see Appendix A, item 6.

To date, Northwestern has received from Congress $43.5 million in appropriations for the three facilities: $25.5 million for BIRL; $16 million for the material science facility on the campus; and $2 million for the Biotechnology Center facilities.

However, these Federal dollars have already leveraged 184 million in non-Federal dollars. If Northwestern's full $12 million request for the Biotechnology Center facilities is subsequently appropriated by Congress, and if both the Research Park and its related research facilities on campus are built out at least to the original estimate of $500 million in capital expenditures, the Federal appropriation for $53.5 million will comprise only 10.7 percent of this total investment.

This economic development project has already produced clear benefits. Attracted by Northwestern's state-of-the-art facilities, expert faculty and well-trained students in such areas as manufacturing, biotechnology and computers, companies have located in the Research Park or increased support for sponsored programs.

The Research Park now has 60 tenant companies representing 850 jobs. University-industry interaction has increased significantly, and industry support for research has risen from 3 percent to 15 percent of all external support.

The project would have been difficult or impossible to start without Federal seed money. It is a matter of fact that people will not invest in sewer pipes, asbestos removal and much of the infrastructure that comprises the science facilities on the campus.

The only source of Federal funds was through direct congressional appropriations. Northwestern and representatives from the city of Evanston approached Illinois Senators and Congressmen, who then agreed to help, prepared proposals and testimonies documenting the needs, cost and benefits of the project, and cooperated with the funding agencies.

We believe these procedures provided adequate information for Congress to exercise its authority in funding projects of this sort. Moreover, we believe the benefits today confirm the judgment of Congress in funding Northwestern's request.

What I would like to do now, Mr. Chairman, is try to answer some of the specific questions you have in a very summarily way.

The objectives of the project were really fivefold. One was to expand the job and tax base of the region and the home community, reverse the science and engineering brain drain from the Midwest. We've produced the most scientists and engineers, and they had been gravitating toward the two Coasts, primarily because of the defense installations located in those areas; facilitate technology transfers through greater collaboration with industry; assist in reversing the net outflow of Federal tax dollars from Illinois. Illinois at that time was receiving 60 cents on the dollar, California, I believe, at the time was $1.20 or $1.30, and Massachusetts $1.20. So we were last in the Nation. And five was to address the decaying science infrastructure, particularly at Northwestern.

This was encouraged by the Civic Committee of Chicago, the Governor's office and the Mayor of Chicago, and encouraged the University of Illinois, University of Chicago and Northwestern to become much more active in the transfer of technology and collaboration with industry.

To date, in terms of results, there are 60 companies in the Park, which is 24 acres, 300,000 square feet has been built out, and there are 850 employees. The tax base for that area has increased by 600 percent. Two million dollars in seed venture capital from local companies and the banks in the area as well as the university has leveraged an additional $45 million in private investment in those same companies, essentially the 60 companies in the park.

BIRL opened its doors in 1988 with zero contract research, and this year we will do approximately $7 million at a time when contract research nationwide has been decreasing, as you well know.

In addition to having an independent employment force, there are 30 faculty and roughly 37 graduate students involved in the contract research funding of BIRL. That is a little bit about the Park.

In terms of the university's sponsored research, from '84 to '93, it grew from $61 million to $155 million, industrial component from $1.9 million or 3.2 percent to $23.4 million or 15 percent.

Biotech area funding increased by 50 percent from $10 million to $15 million, and those facilities are not yet complete. The biotech master's program, interestingly enough, we found that there is not, at least in the Midwest, a biotech master's program focusing on the business of biotechnology, and through an interdisciplinary program in engineering, business, and medicine, we now have that program. Demand for the program far exceeds supply, and we are educating about 25 to 30 students per year. They have internships, and job opportunities far exceed the supply of students.

Corporate outreach and collaboration, roughly over 200 companies have some relationship with the university in terms of training, contract and sponsored research and student internships.

The last question you raised is the question related to proliferation of direct appropriations. Service in terms of the three major roles of the university, has taken on a new connotation, and that is clearly economic development. When I was growing up in Southern Illinois, there was a major initiative to create a new university called Southern Illinois University, and the reason for that was basically because the coal mines were being shut down and universities or State satellite universities were being established not only in Illinois but throughout the country as an economic development tool.

The current modus operandi for a lot of States is to create prisons, again for the purpose of economic stability within various communities, and municipalities, of course, continue to seek congressionally mandated funds. We think that the issue of economic will remain paramount, even in front of private universities, particularly those that have excellent faculties.

The other issue, of course, remains in the area of deferred maintenance. The amount that has been allocated so far by Congress, with a max of $7 million for any one program, simply is insufficient to meet the decaying infrastructure in higher education and in the science establishment.

In terms of suggestions, I simply think that the experience we have had with USDA has been a very positive one in terms of peer review, reevaluation of congressional recommendations, and then a report back to Congress and a monitoring procedure. It is not unlike some of the statements that were made with the prior panel as to what they intend to do, but USDA has had this process in existence for sometime.

Thank you, Mr. Chairman. That is the end of my comments.

[The prepared statement of Dr. Ihlanfeldt follows:]

Testimony Submitted to the
Committee on Science, Space, and Technology

United States House of Representatives

September 21, 1994

William Ihlanfeldt, Vice President
Northwestern University

Introduction

My name is William Ihlanfeldt. I am Northwestern University's Vice President for Institutional Relations, which is the office responsible for government and community relations, and Chairman of the Board of Directors for Research Park, Inc., which is in charge of overall development and management for the Northwestern University/Evanston Research Park. Mr. Chairman, I am pleased to have the opportunity to testify before this distinguished committee about the Basic Industry Research Laboratory (BIRL) and Biotechnology Center facilities and their relationship to an innovative, two-part economic development project: establishment of the Research Park as a joint venture between Northwestern and the City of Evanston; and construction or modernization of related research facilities on campus.

Northwestern is a major research university. In FY1994, Northwestern received a total of $168.5 million in external awards for sponsored programs and had a total operating budget of $678.8 million in expenditures. During the recession of the early 1980s, Northwestern was encouraged by Illinois political and community leaders to employ its research resources in order to revitalize traditional manufacturing and stimulate economic development. However, many of the University's research facilities were outmoded for the conduct of modern science and already utilized beyond capacity. Because no federal programs were available to address this need for academic facilities, Northwestern petitioned Congress to fund construction not only of the BIRL and Biotechnology Center facilities but also of the Materials Science facility. To date, Northwestern has received from Congress $43.5 million in appropriations for the three facilities -- $25.5 million for the BIRL, $16 million for the Materials Science, and $2 million for the Biotechnology Center facilities. However, these federal dollars have already leveraged $184.1 million in non-federal dollars. If Northwestern's full $12 million request for the Biotechnology Center facilities is subsequently appropriated by Congress, and if both the Research Park and its related research facilities on campus are built out at least to the original estimate of $500 million in capital expenditures, the federal appropriations for $53.5 million will comprise only 10.7% of this total investment.

This economic development project has already produced clear benefits. Attracted by Northwestern's state-of-the-art facilities, expert faculty, and well trained students in such areas as manufacturing, biotechnology, and computers, companies have located in the Research Park or increased support for sponsored programs. The Research Park now has 60 tenant companies representing 850 jobs. University-industry interaction has increased significantly, and industry support for research has risen from 3% to 15% of all external support. The project would have been difficult or impossible to start without federal seed money. The only source of federal funds was through direct congressional appropriation. Northwestern approached Illinois Senators and Congressmen, who agreed to help, prepared proposals and testimonies, documenting the needs, costs, and benefits of the project, and cooperated with the funding agencies. We believe these procedures provided adequate information for Congress to exercise its authority in funding projects of this sort. Moreover, we believe the benefits to date confirm the judgement of Congress in funding Northwestern's requests.

1. Why Northwestern University seeks congressionally mandated funds.

At Northwestern University, the decision to seek funds directly from Congress for these academic research facilities was linked to a complex set of factors that became pressing in the 1980s. The nationwide recession of the early 1980s was especially severe in the Midwest where loss of technological initiative among the traditional manufacturing industries had led to a decrease in economic competitiveness, an increase in unemployment, a decline in population, and a net outflow in federal tax dollars. These Rust Belt trends were particularly evident in Illinois and metropolitan Chicago, including Evanston as one of Chicago's oldest suburbs. In response to these problems, the Governor of Illinois and the Mayor of Chicago each formed a high-technology task force. In 1982, both task forces reported favorably on the economic development that had resulted from industry outreach and technology transfer at institutions such as Stanford and MIT, and urged the state's three major research universities (i.e., Illinois, Chicago, and Northwestern) to make greater efforts in this direction.

Northwestern officials were willing to consider this possibility not only because supporting economic development seemed an appropriate role for a research university but also because assisting the troubled economy of its host community and increasing industry support for research and education were legitimate institutional goals. However, an internal assessment of Northwestern's resources and needs related to industry interaction made evident two major obstacles. First, the University's Technological Institute building, which houses much of Northwestern's science and all of its engineering research laboratories, was almost 50 years old, lacking both the space and the technical systems necessary for conducting contemporary research. Second, the University had no infrastructure targeted to the facilitation of industry outreach and technology transfer.

In 1982, Northwestern received a total of $50.4 million for support of sponsored programs, but most of those funds were from federal grants for basic research and graduate education, with only 1.3% of the total from industry. In order to carry out a new policy of outreach toward industry, Northwestern officials developed an evolving plan for an economic development project, which was originally estimated to cost approximately $500 million, primarily from private sources: $400 million to establish the Research Park in downtown Evanston adjacent to the campus; and $100 million to expand and modernize related science and engineering laboratories on campus. However, when this plan has been fully implemented, the total capital investment is expected to be higher.

The main scientific focus for this project was in three high-technology areas: advanced manufacturing technology, with a special emphasis upon materials; biotechnology; and computer technology. Specific mechanisms were devised for industry interaction in each of these three areas. Northwestern planned to assist the traditional manufacturing industries mainly by building upon strength in material science. The Materials Science and Engineering Department and Materials Research Center, which already attracted industry support for basic research and graduate training, were to be enhanced by a new, state-of-the-art facility on campus. BIRL was designed to conduct applied R&D and technology transfer, drawing from basic research in materials on campus, to perform contract research with industry, and to act as an anchor facility for the Research Park. The Biotechnology Center, which was intended to coordinate basic research and graduate training in biotechnology and to initiate applied research and technology transfer, was targeted especially toward the approximately 40 biotechnology companies in the Chicago area. The Institute for Learning Sciences, which was established together with an expansion of faculty in computer science and artificial intelligence, constituted a response to the business needs of Chicago as a growing center for information services and software development.

In the early 1980s, there were virtually no federal dollars for construction and none for modernization of academic research facilities -- not to mention for ambitious and innovative plans of this scope. Northwestern commissioned a feasibility study that estimated Northwestern could raise much, but not all of the needed funds from private sources. In addition, there was an immediate need for seed-money to initiate the project. A Northwestern survey of existing research parks revealed that initial government funds often leveraged subsequent private investment. In 1984, Northwestern began to seek support from all levels of government for the Northwestern University/Evanston Research Park and its related research facilities on campus: from the Evanston Mayor and City Council, for contributions of land, infrastructure, and operating subsidies; from the Illinois Governor and the General Assembly, for funds to support a small business incubator in the Research Park and to modernize research laboratories on campus; from the U. S. Congress, for funds to construct the BIRL and Biotechnology Center facilities.

In FY85-86, the Congress appropriated $25.5 million to Northwestern for the total cost to construct BIRL. In FY88-89, the Congress appropriated $16 million to construct the Material Science facility, for which the total cost was $26 million. In FY91-94, Congress appropriated approximately $2 million of the $12 million requested as 50 percent of the cost to construct and modernize facilities for the Biotechnology Center. These federal funds have been leveraged many times over by local, state, and private funds. The Institute for Learning Science was established with a five-year grant of approximately $15 million from Andersen Consulting. As of July, 1994, non-federal investment in the Research Park totals approximately $111.5 million ($11.7 million from the City of Evanston, $6.6 million from the State of Illinois, and $93 million from private sources); non-federal investment in the related research facilities on campus totals approximately $72.6 million ($16.2 million from the State of Illinois and $56.4 million from private sources).

In sum, several interrelated factors motivated Northwestern to seek funds directly from the U. S. Congress for academic research facilities. In response to the recession of the early 1980s, state and local officials encouraged the University to develop mechanisms that would increase the technological competitiveness of the region's manufacturing industries by facilitating industry interaction and accelerating technology transfer. After review, University officials approved an economic development project that was designed to accomplish that purpose -- the establishment of the Northwestern University/Evanston Research Park and the expansion and modernization of its related research facilities on campus. However, sufficient private funding could not be raised to support the entire project on a timely basis, and there were no federal programs to address these needs. Therefore, Northwestern officials sought and received funding at all levels of government through the legislative process, based upon the merits of the project as described in the submitted proposals. To date, the $43.5 million in federal funds appropriated for academic research facilities at Northwestern have been leveraged by the $184.1 million in non-federal funds received for the Research Park and its related research facilities on campus. Furthermore, the federal and non-federal investments in this project have paid off handsomely in terms of local, state, and regional economic benefits and University research and education benefits.

2. The benefits of these projects to the University's educational and research mission, as well as any related local, state, or regional benefits.

Northwestern's economic development project was designed to produce several benefits: to revitalize the University's base of operation in the aging suburb of Evanston; to assist state and regional industry by expanding the University's research collaboration and technology transfer; and to promote the University's goal of obtaining greater federal, state, and private support for graduate research facilities and programs. To begin realizing these benefits, Northwestern signed a Statement of

Understanding with the City of Evanston to create the Research Park as a joint venture in February of 1986. In June of 1986, the Technology Innovation Center (an incubator for start-up, technology-based businesses) began operation. BIRL opened for business in November of 1987. The agreement with the Charles H. Shaw Company as exclusive developer was signed in that same month, the developer's first new office/research building was occupied in June of 1989, and the second in May of 1991. In September of 1989, the Institute for the Learning Sciences was established, and in November of 1990, the Biotechnology Center began to operate.

As of July, 1994, the Research Park has 300,000 square feet of office and laboratory space, which is 96% occupied. These additions to the tax rolls have generated $4.7 million in new tax revenues since 1987, representing a 600% increase of property values within the Research Park development area. The Research Park currently has 60 tenant companies and organizations that have an employment of 850, including 600 new jobs. These figures reflect a significant contribution toward the economic development goal of revitalizing the local economy.

The second benefit -- to increase industry collaboration and technology transfer -- has been accomplished through various means. The start-up, technology-based firms in the Technology Innovation Center currently involve 10 faculty, 24 students, and 22 alumni. The Institute for Learning Sciences, which has major corporate support for the development of multimedia training software based on artificial intelligence, now involves 13 faculty or research associates and 56 graduate students. Since its founding in 1989, the Institute has received $22 million in corporate support as well as $11 million in federal support.

One way the Biotechnology Center accomplishes technology transfer is through its training programs. The Center has established a Master's degree program in biotechnology for approximately 25-30 students per year, and the National Institutes of Health (NIH) has awarded a nationally competed training grant to fund a new Ph. D. program in biotechnology, starting with 6 students this year. All students from both programs participate in industrial internships, for which corporate demand exceeds student supply. The Biotechnology Center also promotes industry interaction and technology transfer by a wide variety of seminars and conferences.

External support for biotechnology research has also increased significantly. Because inadequate laboratory space threatened to curtail the growth of biotechnology research, with full knowledge of USDA and the relevant committees of Congress, Northwestern debt financed and proceeded with construction and modernization of the Biotechnology Center facilities. Therefore, although only one-sixth of the requested federal dollars have been awarded, faculty have already occupied more than half of the planned new and renovated laboratory space. As a consequence, two new hires were made, and funding for biotechnology research increased by 50% from $10.9 million in FY1990 to $15.6 million in FY1993. One example of industry collaboration is a recent $4 million grant from NIH to Abbott Laboratories and Northwestern for joint research aimed at developing a drug for Alzheimer's Disease. Another is NIH-supported research that led to the first cloning of the receptor for the growth-hormone-releasing hormone -- a critical regulator of animal growth -- research now being funded by Eli Lilly and Company.

BIRL was one of a pair of new units established specifically to stimulate industry collaboration and research commercialization -- the Basic Industry Research Laboratory in the Research Park and the Basic Industry Research Institute (BIRI) on campus. Although BIRL and BIRI were originally envisioned to focus upon the older, basic industries (i.e., traditional manufacturing) in Illinois and the Midwest, both organizations have broadened their scope to include the newer, high-technology industries. The mission of BIRL is to improve the competitiveness of industry through contract-based applied R&D, including scale-up, pilot-plant, prototype, and training activities. In order to draw upon basic research strengths on campus, the main technical emphasis at BIRL is on four areas involving materials and manufacturing processes related to materials: advanced materials development and analysis; vapor-deposition coatings; gear research; sensors and controls. Although BIRL opened its doors in 1987, the laboratories were not properly fitted for research until the end of 1988. R&D revenues at BIRL have increased from $.5 million in FY1989 to $7 million in FY1994 -- funds awarded on a competitive basis. During that period, 30 faculty and 37 graduate students have been funded at the level of approximately $3 million in various multi-year projects.

More important, BIRL has enabled Northwestern to expand its mission beyond basic research to applied research and development, thus transferring to industry new technology that promotes increased competitiveness in the global marketplace. One example is recent research on superhard coatings for improved wear resistance. About four years ago, two Northwestern faculty members were performing basic research on coatings for metals -- one investigating carbon nitride with a grant from NSF, the other developing very thin layers of various materials with a grant from USDOE. Because of the unique facilities and expertise at BIRL for producing special coatings, the two faculty members and their graduate students conducted this research in cooperation with scientists at BIRL. BIRL staff subsequently identified practical applications for these coatings on cutting tools and other machinery in order to reduce wear or abrasion in service and extend service life. About one and a half years ago, BIRL initiated a multi-client project, in which 13 companies from Illinois and elsewhere funded tests and demonstrations on these coatings for a variety of specific needs. The companies ranged from large national corporations to small local firms. As a result, two such companies are expecting to use these coatings on their products in the commercial marketplace next year. In sum, because of interaction among basic scientists on campus, applied scientists at BIRL, and industry contacts, Northwestern has been able to move a new technology into commercial use within about five years from inception of the basic research.

Although BIRL conducts research for large corporations nationwide, many projects are for small and medium-sized firms in the Chicago area and throughout the Midwest. For example, BIRL carried out a project for a consortium of five small, Chicago-area electroplaters representing approximately 125 jobs. These firms were threatened with closing because of difficulty in meeting new environmental standards for the waste water from their operations. BIRL scientists modified water purification equipment to meet the new regulations, allowing the firms to stay in business and saving a significant number of local jobs. A year ago, BIRL worked with the City of Chicago to help them apply for and receive funding through the Technology Reinvestment Program for the Chicago Manufacturing Center, which will assist small Chicago-area manufacturing firms. Now that the center is in operation, BIRL will be a major resource to provide R&D assistance for those companies. BIRL is also the Illinois affiliate of the Great Lakes Industrial Technology Center, which is part of the Federal Laboratory Consortium. The role of BIRL is to contact small and medium-sized companies in Illinois, discover what problems they have in their manufacturing operations, and then survey the technologies available from the national laboratories to solve those problems.

The mission of BIRI, the counterpart of BIRL on campus, is to promote industry interaction with faculty, students, and programs by serving both as a "window in" for companies seeking technical assistance and as a "window out" for Northwestern personnel wishing exchange with the industrial world. BIRI was designed to encompass those engineering and science departments and interdisciplinary research centers that already had or were expected to have the greatest industry interaction. BIRI coordinates and facilitates a variety of University-industry activities, mainly through the Tech Corporate Partners Program -- the industry affiliates program for the McCormick School of Engineering. During the period since 1988, when the BIRI office opened and the Research Park became operational, industry interaction has significantly increased. The number of engineering faculty who consult with industry has risen 83% to approximately 125 per year, and the number who conduct research supported by industry has risen 23% to approximately 35 per year. The number of industry personnel participating annually in continuing education programs for engineering has more than doubled to approximately 485 per year. The number of engineering students enrolled in co-op employment with industry has also more than doubled to approximately 235 per year. Since its founding in

1988, Tech Corporate Partners has increased its industrial affiliates to 26 companies.

The third projected benefit of the economic development project was to increase federal, state, and private support for Northwestern's graduate research enterprise. This project involved not only establishment of the Research Park but also expansion and modernization of related research facilities on campus. The antiquated Technological Institute building, which houses most of Northwestern's science and all of its engineering laboratories, totals 729,000 square feet -- the largest such interconnected academic research facilities complex in the nation and a significant part of the Midwest's research infrastructure. Based upon early estimates that a replacement facility would cost more than $200 million, Northwestern adopted a strategy that was expected to cost less than $100 million -- $68 million for phased modernization of the existing building, plus $26 million for the new Materials Science facility. With the process well under way, cost estimates for completion of the modernization have now increased to approximately $125 million or a total of $150 million including the Materials Science facility. However, owing largely to the visibility of the Research Park and the expansion of industry outreach, Northwestern has raised approximately $72.6 million from state, corporate, and other private sources toward that goal. In addition, during the most recent decade for which data are available (1984-1993), federal, state, and private support for research and education have more than doubled from $60.9 million to $155.3 million per year. More striking, industry support has increased twelvefold from $1.9 million or 3.2% of the total to $23.4 million or 15.0% of all external funding for sponsored programs.

3. How the projects relate to the mission of the funding agencies, as well as national goals and priorities.

The mission of BIRL is most closely related to two aspects of the USDOE mission -- increasing the energy conservation and improving the economic competitiveness of U. S. industry. When the mission of BIRL was being defined, Northwestern officials, in consultation with USDOE officials, decided that the technical focus of BIRL should be materials because of the dominant role that materials play in many approaches to energy conservation. Since the production of materials is extremely energy intensive, any improvements in efficiency can have a considerable impact on energy consumption. Similarly, developing materials that are more effective and longer lasting can reduce the need for energy consumption. For these reasons, many of the thrusts within the USDOE Office of Conservation and Renewable Energy specifically address materials issues, especially within the Office of Industrial Technologies and the Office of Transportation Technologies. In many ways, the structure and operation of BIRL reflects the materials interests of those two offices. To ensure that the mission of BIRL continues to parallel these thematic interests of USDOE, the director of BIRL visits several times a year with officials in the USDOE Office of Conservation and Renewable Energy.

About half of the funding for BIRL comes from industry. The three largest segments of the BIRL customer base are the following:

- Aerospace companies and their suppliers, for which BIRL develops lightweight materials that can withstand high temperatures for improved fuel efficiency;
- Automotive companies and their suppliers, for which BIRL also develops lightweight materials for high-temperature uses, plus wear-resistant materials for greater fuel efficiency;
- Energy transportation companies (pipeline companies and electric utilities), for which BIRL helps improve the safety and reliability of the energy supply;
- General manufacturing companies, for which BIRL solves a variety of shop-floor problems in order to reduce cost, improve quality, and increase flexibility.

The other half of the funding for BIRL comes from federal mission agencies. For the past 5 years, approximately $1.4 million has come directly from the Department of Energy in the form of competitively won contracts, most of which were focused upon finding ways to reduce the friction and wear, and thus the energy consumption, of vehicles and other moving machinery. Major funding has also come from the National Aeronautics and Space Administration, the Department of Transportation (including the Federal Highway Administration, the Federal Aviation Administration, and the National Highway Transportation Safety Administration), the Department of Defense (including Wright Laboratories, the Army Material Technology Laboratory, the Office of Naval Research, and the Advanced Research Projects Agency), and the National Institute of Standards and Technology within the Department of Commerce.

The Biotechnology Center facilities proposal, which was required by the Cooperative State Research Service (CSRS) of USDA, described in detail six areas of basic research at Northwestern relevant to the mission of USDA:

- Animal development and genetics -- studies into the biochemistry and physiology of animals on topics such as pituitary growth hormone, growth-hormone-releasing hormone, and regulation of gene expression during animal development;

- Hormones and reproduction -- investigations on hormones that regulate stages in the reproductive cycles of animals, lactation, and circadian rhythm;

- Drugs, vaccines, and disease and pest control -- studies that explore the structure and transport of animal viruses, their serological properties, and the application of this knowledge to prevent and cure infection;

- Food processing and storage -- research on such topics as fermentation in food processing for the purpose of reducing spoilage, and neuronal pathways of odor and taste for the purpose of increasing the appeal of foods;

- Plant productivity -- investigations on the biochemistry and physiology of plant growth and development in areas such as potassium transport systems, sulfa metabolism, nitrogen fixation, and photosynthesis;

- Environmental detoxification -- genetic and biochemical examination of organisms with the capacity to detoxify environmental pollutants such as mercury and other heavy metals.

A facilities study panel, including two CSRS officials and three scientists from major Midwest universities, cited projects in these six areas as evidence "that well demonstrates the considerable ability of the faculty to undertake biotechnology research of significance to agriculture". The panel noted that "inadequate laboratory space" was a "severely limiting factor", and that "the proposed construction and renovation will allow scientists at Northwestern University to address a greater number of agriculturally important problems using molecular-level tools". The panel also observed, however, that increased research funding from USDA may depend partly upon whether "significant funding was made available to the National Research Initiative", the budget for which has not been increased as rapidly as hoped at that time. The panel summarized its merit review by concluding that "this is an important, necessary facility, which has the potential to increase the capacity at Northwestern University for research discoveries that could have significant, long-term impact on U. S. agriculture."

4. The protocol you have developed with the Department of Energy (USDOE) and the Department of Agriculture (USDA) to monitor progress and ensure the quality of congressionally mandated projects.

With regard to the construction of the BIRL facility, officials from the Office of the University Architect followed specific guidelines, as outlined in a USDOE grants management procedures booklet, submitting regular written reports, and meeting on a quarterly basis with officials from the regional office of USDOE located in Chicago. As far as we know, USDOE officials were fully satisfied with Northwestern's performance. With regard to the construction and modernization of the Biotechnology Center facilities, USDA has monitored the project and reviewed all contracts. As the result of a review conducted this summer, Northwestern has certified and USDA has acknowledged that the University is in compliance with the Special Terms and Conditions -- for this grant.

5. The reasons that you believe have led to the proliferation of direct appropriations for academic facilities and what procedures need to be established to address this situation.

I believe that the two main reasons behind the increase of direct congressional appropriations for academic research facilities are the lack of a viable funding alternative and the benefits deriving from economic development. The first reason is that federal support for academic research facilities peaked in the late 1960s and virtually disappeared by the early 1980s. In 1984, a report of the Business-Higher Education Forum projected the accumulating cost of all academic facility needs in America at $60 billion. In 1985, a conference sponsored by the National Academy of Sciences produced an estimate of $20 billion for academic research facilities alone. In 1988, a NSF survey found that less than one-quarter of all space currently used for academic research is "suitable for use in most highly developed and scientifically sophisticated research", and that almost 40 percent is in need of repair or renovation if it is to be used effectively. In 1988, Congress passed the Academic Research Facilities Modernization Act, but in FY93, Congress had still appropriated only $37.5 million of the $250 million authorized. Funding for that program rose to $105 million in FY94 and will be at $250 million in FY95. However, after more than two decades of neglect, the multibillion dollar academic facilities problem is of such proportions that even $250 million per year cannot be expected to meet all the current needs. Therefore, direct appropriations have been for some time the only viable alternative to the academic facilities shortfall, and will likely remain a necessity in the immediately foreseeable future.

The second reason for this growing practice is that the American economy has been experiencing a period of declining industrial competitiveness and significant structural change. In this context, the multiplier effect not only of "big science" projects, like the accelerators and the space station, but also of smaller-scale projects, like the Northwestern University/Evanston Research Park, provide needed local, state, and regional economic-development benefits. In the past, the major state universities often participated in economic development as part of their public service mission. At present, the major private universities are also expected to participate aggressively in such projects.

Although peer review has proved to be a successful, if not uncontroversial, means of allocating federal resources for individual science projects, Members of Congress have often intervened regarding science projects that promise economic development. During the period following World War II when federal investment for R&D expanded rapidly, the decisions to establish major university research laboratories at MIT, Columbia, Berkeley, Cal Tech, Chicago, and Iowa State were not made by peer review. Subsequent decisions about large federal investments in science, such as the location of the magnet laboratory at Florida State rather than MIT, continue to be made through a range of review mechanisms, rather than by exclusive reliance on peer review.

The growth of direct appropriations for academic facilities has stimulated an intense debate -- not unlike the debate over the establishment of NSF -- about how Congress conducts, and should conduct, the nation's science policy. This debate has elicited elitist rhetoric in favor of peer review and populist rhetoric in favor of direct appropriations. However, the debate has also revealed two related problems in science policy. First, no adequate policy exists to account for economic development in decisions about the allocation of federal science dollars. Second, no agreement exists about the appropriate role of Congress in science policy. Regarding federal investment in academic facilities, congressionally mandated funding has been the primary means utilized during the last decade and a half. However, as a somewhat ad hoc means of congressional participation, direct appropriations can introduce instability into the process of allocating federal resources for science.

If the level of rhetoric is lowered in this debate, Members of Congress and representatives of the science community may be able to acknowledge that this method of funding academic facilities has highlighted genuine policy issues that call for innovative solutions. Congressionally mandated funding is not the only means of introducing extrinsic values into the process of decision making for science resources. Other possibilities include numerous possible mechanisms to involve the funding agency in final decisions about direct appropriations; various mixtures of merit review, economic criteria, and congressional action; or separate tracks for decisions about basic research on the one hand and infrastructure to facilitate applied R&D, technology transfer, industry collaboration, and economic development on the other. In fact, the USDA process of requiring a proposal and a merit review is a good example of one approach to this problem. Rather than viewing science policy in dichotomous terms as direct appropriations versus peer review, Members of Congress and representatives of the science community might consider the possible strategies for science infrastructure decisions and develop an acceptable approach that balances the need for both scientific review of intrinsic criteria and congressional review of extrinsic criteria.

The CHAIRMAN. Thank you very much, Dr. Ihlanfeldt.

Can we go ahead with Dr. Bloom?

Mr. BLOOM. Thank you, Mr. Chairman, members of the committee. First, let me start by thanking Representative Furse for a very kind introduction and for your being here today.

My name is Joe Bloom. I am the newly appointed Dean of the School of Medicine at Oregon Health Sciences University. Dr. Peter Kohler, our president, was unable to attend this particular meeting today and sends his regrets.

I assume, Mr. Chairman, that my comments will be entered into the record——

The CHAIRMAN. In full. And we regret that your president couldn't be here, but he made a special trip last year——

Mr. BLOOM. Yes.

The CHAIRMAN [continuing]. Which we appreciated very much.

Mr. BLOOM. Thank you.

I'm going to be sensitive to the time here and cut my remarks as close as I can. I want to tell you a little bit about our university and then speak to you about the program under question.

Oregon Health Sciences University is the only academic health sciences center in Oregon. We're a public institution.

We are comprised of three schools—dentistry, medicine and nursing—four research institutes, adult and children's hospitals and ambulatory care facilities, and a number of allied health programs, including a rich development of outreach services to Oregonians in every corner of our State.

We have more than 2200 students attending the university, and our hospitals and clinics see over 100,000 people a year, mainly from Oregon, southern Washington, or people from all over the country. However, many of our patients are indigent. We are simply the largest provider of indigent care services in Oregon.

Our research component is developing. We are recognized as a university of growing national stature in research. Our scientists are involved in a wide variety of research endeavors. Currently our scientists receive $65 million to $735 million per year in research funding.

Like all other academic health care centers in this country, Oregon Health Sciences University is facing dramatic challenges. Health care delivery has shifted from fee-for-service to managed care. Reimbursement for educational and indigent care services have dropped steadily in the last years.

Because of the Oregon Health Plan, which we strongly support, we are farther along in the conversion to managed care than many other academic centers in the country. We operate in one of the most competitive environments, health care environments in the country.

The Biomedical Information Communication Center—BICC—is a cornerstone of our program, and it is critical to our success. It is interwoven into many of our projects. BICC is a communications and information hub for the institution. It has very important statewide outreach efforts. It was constructed in 1991.

It is at the same time a research institute, a 21st century medical library, and a state-of-the-art high-speed telecommunications system that links providers and individuals throughout the State to services at OHSU and other urban centers.

The library is open to community practitioners and the general public, houses 214,000 volumes, subscribes to 1200 journals.

The growing informatics research program is heavily involved in outcomes research, including a recently received $2.8 million telemedicine research project funded by the National Library of Medicine. This study is designed to assess the efficiency of long-distance diagnosis and treatment of dermatological conditions.

Perhaps the best known and most widely appreciated function of the BICC is its role as a telecommunications hub. BICC facilities are used to transmit monthly continuing education courses to health care providers throughout the State, provide basic and advanced nursing education to three off-campus sites, and to place bound individual students in 5 eastern Oregon towns, and to provide a communication link for our area health education trainees and preceptors, linking the university campus to rural—to sites all over our State.

In addition, the majority of rural hospitals around the State, 57 in all, are now linked by computer to the BICC, allowing their staff access to library and research data. Recently, one of these rural hospitals signed a contract with us to provide computing services which the hospital could not afford on its own.

As part of this project, which is being in cooperation with the Nation's largest health care software provider, lifetime medical records will be developed for all patients seen at this rural hospital.

Individual practitioners also benefit from the services of the BICC. Physicians utilize the BICC's 2-way audio-video capabilities to broadcast X-ray images, consult with specialists on the OHSU campus. In short, BICC allows students, trainees, practitioners, and members of the general public to receive educational, clinical and professional services without traveling long distances.

We believe that we are making a significant contribution to cost effective health care delivery. The BICC helps by facilitating training of more primary care providers, by providing isolated practitioners the supports that they need to maintain adequate rural practices, by reducing the need for time-consuming and costly trips to urban areas and by furthering health outcomes research efforts.

In addition, Oregon provides an ideal laboratory for such an effort. The State is already among the lowest in cost for health care services as measured by lengths of hospitalization.

The infrastructure under development will allow both the development and assessment of cost saving and quality enhancement measures in health care delivery in this statewide network.

We believe that the BICC relates to our national priorities, including energy issues. The BICC is a developing telecommunications network linking all areas of the State in keeping with national goals to create a telecommunications highway which would allow Americans to work, learn, and communicate from home or their local communities, reducing travel time, et cetera.

Development of lifetime clinical records is a key project of our program is critical to the accurate assessment of health outcomes, which is another national priority.

Finally, capitalizing the costs of this type of technology is very expensive, and those who need it the most cannot afford to pay the up-front cost. Rural hospitals cannot pay for them. Rural practitioners cannot, and rural citizens cannot. And a major point that I would emphasize to you, neither can publicly oriented academic health centers.

As mentioned, OHSU is already facing tremendous financial strains like many of our other academic institutions with declining reimbursements, greater demands for service, and an increasingly competitive marketplace. Without the help that we were provided, we would not have been able to develop this program.

Finally, Mr. Chairman, I would invite any member of the committee to visit our campus and to see this facility firsthand. I think that will demonstrate to all much better than we can say here in Washington what this program is all about.

And I thank you for your time.

[The prepared statement of Mr. Bloom follows:]

Testimony
By

Joseph D. Bloom, M.D.
Dean, School of Medicine,
Oregon Health Sciences University

Before the
Committee on Science, Space and Technology
U.S. House of Representatives

Hearing on Academic Earmarks

September 21, 1994

Congressman Brown and Members of the Committee, thank you for the opportunity to join you here today to discuss the academic earmark process and how that process has affected Oregon Health Sciences University (OHSU). My name is Joseph Bloom, M.D., and I am the Dean of the School of Medicine at OHSU. Dr. Peter Kohler, President of the university, sends his regrets. He would have liked to have attended this hearing himself but was unable to do so as he had a prior critical commitment and the hearing could not be rescheduled. Copies of testimony Dr. Kohler prepared for a hearing which was scheduled and then cancelled last fall can be made available to any Member who would like them. I believe the Chairman had the opportunity to go over that testimony personally with President Kohler when he was in Washington for that earlier hearing.

The letter we received from the Chairman asked us to provide information about the Biomedical Information Communication Center (BICC) and to address several questions, including why OHSU seeks earmarked funds and how these funds benefit the University, the state and the region. To fulfill that request I need to first provide some background on OHSU and the role it plays in our state and region.

Oregon Health Sciences University is the only academic health sciences center in Oregon. It is comprised of three schools (Dentistry, Medicine and Nursing), four research institutes, adult and children's hospitals and clinical facilities, a number of allied health programs and a series of multidisciplinary units. Through these programs and facilities OHSU provides educational, clinical, research and outreach services to Oregonians in every corner of our state. More than 2,200 medical, dental, nursing, basic biomedical science and allied health students and trainees are enrolled at OHSU each year. The university's hospitals and clinics offer state-of-the-art medical care and serve as a primary statewide referral center for specialties ranging from primary care to Level 1 trauma services to more than 100,000 Oregonians each year -- many of whom cannot afford to pay for that care. (OHSU is the largest provider of indigent care in Oregon.) Other Oregonians and residents of adjoining states benefit each year from a variety of OHSU outreach programs, including programs which bring minority and female high school students on campus each summer to give them first-hand experience in a scientific environment. OHSU is working right now with the Portland Public Schools to help set up a health high school that will give young people a jumpstart on a career in science and health.

The final pillar of the OHSU enterprise is research. Recognized as leaders in research at the molecular and cellular level, OHSU scientists are involved in research in areas as diverse as identifying genetic markers for neurological and psychiatric disorders to investigating the potential for boron neutron therapy as a treatment for brain cancer. OHSU researchers also are collaborating with other health professionals to study the effects on human health of exposure to radiolabeled chemicals and electromagnetic fields as well as other environmental and occupational hazards. In all, OHSU scientists receive $65-$75 million per year in research funding.

Today, like all other academic health centers, OHSU is in the midst of dramatic change. Health care delivery has shifted from fee-for-service to managed care. Health education is moving away from a decades-old emphasis on training of specialists to training of primary care practitioners. Reimbursement for educational and indigent care costs have dropped steadily as a result of federal and state budgetary pressures. Unfortunately, neither the costs of education nor the needs of low-income Americans have decreased along with the payments.

At OHSU, we are confident that we can rise to the challenge of this new era in health care. Thanks to the Oregon Health Plan, we are much further along in the conversion to managed care than many of our academic health center counterparts. We have revised our medical school curriculum to provide early hands-on experience and to train medical students on how to access and retrieve data rather than rely on rote memorization as was the practice in past decades. New emphasis has been placed on training primary care practitioners. Our Area Health Education Centers Program, which trains practitioners on-site in rural communities in an effort to encourage rural placement upon completion of their residency, is thriving.

Interwoven in all of these efforts -- and critical to their success -- is the Biomedical Information Communication Center (BICC). BICC is the communications and information hub of OHSU and its statewide outreach efforts. Constructed in 1991, BICC is at the same time a research institute, a 21st Century medical library and a state-of-the-art high speed telecommunications system that links providers and individuals throughout the state to services at OHSU and other urban centers. The library, which is open to community practitioners and the general public as well as the campus community, houses 214,000 volumes and subscribes to over 1,200 medical, nursing, dental and allied health journals. The growing informatics research program is heavily involved in outcomes research, including a $2.8 million telemedicine research project, recently funded by the National Library of Medicine under the High Performance Computing and Communications initiative. This peer-reviewed proposal is designed to assess the efficacy of long-distance diagnosis and treatment of dermatological conditions.

Perhaps the best-known and most widely-appreciated function of the BICC is its role as a telecommunications hub. BICC facilities are used to transmit monthly continuing education courses to health care providers throughout the state and to provide basic and advanced nursing education to three off-site campuses and to placebound individual students in five Eastern Oregon towns. AHEC trainees and preceptors utilize the services of the BICC to communicate back to the OHSU campus from rural sites. The majority of rural hospitals around the state -- 57 in all -- are now linked by computer to the BICC, allowing their staffs to access library and research data. In what may be a first in the nation, one of these rural hospitals (Mid-Columbia Medical Center in The Dalles) has signed a contract with OHSU for the university to provide computing services which the hospital could not afford on its own. As part of this project, which is being conducted in cooperation with SMS, the nation's largest health care software provider, lifetime medical records will be developed for all patients seen at the rural hospital. Development of lifetime medical records that are accessible to clinicians and primary and referral hospitals is not only essential for health outcomes research, but will significantly enhance the life-saving potential of emergency medicine decisions in rural areas that have previously had no rapid access to critical clinical information.

Individual practitioners also benefit from the services of the BICC. Physicians utilize the BICC's two-way audio/video capabilities to broadcast x-ray images and consult with specialists on the OHSU campus.

In short, BICC is allowing students, trainees, practitioners, and members of the general public to receive educational, clinical and professional services without traveling long distances. Not only is this more time and energy-efficient, it also is helping to solve the health access problem in rural communities by providing needed back-up to current practitioners and on-site training to future practitioners that will keep them involved and invested in the local community and reduce chances they will relocate to an urban environment upon completion of their training program.

The BICC, and the many benefits it provides to the state and region, would not exist without the federal government. The project was built with federal funds. Start-up and initial operations were provided through a National Library of Medicine contract. And the infrastructure -- the building of the backbone that is tying the state together -- is being funded in part by the federal government.

Has the government gotten its money's worth? Absolutely. You've undoubtedly heard more than you cared to in the past few months about health care access, health care costs and how to increase the former without increasing the latter. Without belaboring the point, health care is expensive, and the federal government is paying a goodly portion of the tab. Any project that can help address this situation by facilitating training of more primary providers, providing isolated practitioners the supports they need to maintain rural practices, reducing the need for time-consuming and costly trips to urban areas and furthering health outcomes research efforts is a plus for the federal government. And Oregon is the ideal laboratory for such an effort. The state is already among the lowest in cost as measured by use of hospitals, the most expensive component of health care, for both Medicare and commercial carriers. The infrastructure under development will allow both development and assessment of cost-saving and quality enhancement measures in health care delivery.

But what about other national priorities, including energy issues? Does BICC relate to them? Again, absolutely. The whole concept of the BICC as the hub of a telecommunications network linking all areas of the state is in keeping with national goals to create a telecommunications highway which would allow Americans to work, learn and communicate from home, reducing travel time, energy costs and environmental pollution. Development of lifetime clinical records, a key BICC project, is critical to accurate assessment of health outcomes, another national goal. Development of regional outcomes databases is also key to answering questions about the effects of long-term, low-level exposure to various environmental factors related to the production and distribution of energy.

Questions have arisen about the genesis of some projects funded by earmarks. The BICC is part of the University's master plan which was approved through the usual thorough process, one which requires on-campus approval, approval by the Oregon State Board of Higher Education, and, ultimately, approval by the Oregon Legislative Assembly. A variety of types of funding, including federal funds, have gone into development and operation of the facility. The federal funds were a key component of the funding, however, and without them the BICC would not exist today. Capitalizing the costs of the type of technology the BICC represents is enormously expensive and those who need it the most cannot afford to pay the upfront costs. Rural hospitals cannot. Rural practitioners cannot. Rural citizens cannot. And neither can OHSU which is already facing tremendous financial strains with declining reimbursements, greater demands for service and an increasingly competitive marketplace.

The Chairman has asked whether there is an alternative to the earmark process. During the 1960s there was a separate fund for higher education capital and infrastructure projects. In recent years only token amounts -- if any -- have been appropriated for these purposes. Earmarks have become the only viable solution. There has been talk in Congress recently of reinstituting an adequate capital fund through the National Science Foundation or some other agency. Some slight progress has been made toward that end, but not nearly enough. An adequately funded capital and infrastructure program would go far toward meeting the critical needs of academic health sciences centers and other institutions of higher education.

Virtually every funding decision Congress makes can or does come under attack from one quarter or another. Either you're spending too much on defense, too little on education or vice versa, depending on who's talking. There are an endless number of stories about gold-plated hammers and worthless projects. Almost every taxpayer has heard at least one such story.

The BICC is not one of those stories. The BICC is an example of what taxpayers say they want more of: real programs involved in real work designed to improve the lives of real people. We are proud of the BICC, the progress it has made and the promise it holds. I would invite each and every one of you to come out and see for yourself how the BICC is putting taxpayers' money to use to improve their lives and their future.

Thank you again Mr. Chairman for this opportunity to speak. I'd be glad to answer any questions.

The CHAIRMAN. Thank you for that excellent statement on behalf of the Oregon Health Sciences University. I haven't visited the university. I've visited a number of other Oregon institutions, and, of course, Oregon is the leader in the quality of the work that it is doing in many of its institutions, and particularly in the health field.

May we proceed to the last member of the panel, and then we will open it up for questions.

Dr. Aschenbrener, the Chancellor of the Medical Center at the University of Nebraska.

Ms. ASCHENBRENER. Thank you, Chairman Brown, and members of the committee. I am Chancellor of the University of Nebraska Medical Center, which is one of four campuses of the University of Nebraska. I am appearing before the committee today in response to the chairman's request that Dr. L. Dennis Smith, the President of the University of Nebraska appear. Dr. Smith is unable to be here today because of a scheduling conflict, and he asked me to express his regrets to the committee.

President Smith has been very supportive of the Medical Center's effort to establish a Transplant Center, and he welcomes the opportunity, as do I, to provide information to this committee.

The University of Nebraska Medical Center has built outstanding programs in transplantation that provide comprehensive treatment for cancer and for diseases of the liver, small intestine, kidney and pancreas. The reputation of the programs and faculty attracts patients from across the United States and from several foreign countries.

For example, in 1992, the liver transplant program treated patients from 22 States. That same year the bone marrow transplant program treated patients from 36 States.

UNMC is the center of excellence for 23 insurance companies and managed health care systems for transplantation. It is a regional and a national resource.

Since 1985 more than 800 bone marrow and more than 700 liver transplants have been performed on patients who reside outside the State of Nebraska.

Basic and clinical research programs at UNMC have helped shape the field of transplantation and our faculty have been successful in attracting peer reviewed program support. To address significant national concern with the economics of health care and to maintain UNMC's leadership role in research and clinical service, we believe we must find new ways to address the high cost of transplantation.

UNMC has the expertise and the desire to address the issues of cost containment, outcome analysis, resource allocation, and dissemination of new technology. From 1988 to 1993, the bone marrow transplant program experienced a decrease in the average length of stay from 51.1 days to 29.8 days. Similarly, the costs associated with such transplants were reduced on average from 140,000 to 100,000 per transplant.

We believe that our faculty through innovative practice and scientific breakthroughs can continue to be world leaders in transplantation.

In order to address the significant scientific, economic and ethical concerns related to transplantation therapy, we have developed plans for a clinical and laboratory transplant research complex, the Transplant Center.

In addition to serving the needs of patients from Nebraska and the surrounding region, this unique facility will be a valuable resource for the Nation. The aims of the Center will be, first, to develop care systems that optimize the efficient use of medical facilities, personnel, patient personal support systems, and innovative biotechnology to provide the best possible care at the lowest cost.

Second, to develop and standardize assessment of resource utilization and the quality of outcomes. Third, to provide an environment that will foster interaction among the disciplines involved. And fourth, to develop health information networks that extend to the general public as well as to the medical community. Such a complex we believe could serve as a model to test and develop health care strategies for the next century.

This Transplant Center will pioneer a new, more cost effective approach to the care of transplant patients by adapting the model of cooperative care to move patients quickly from the higher cost acute care hospital setting to the lower cost setting of cooperative care units in a day hospital located in the transplant facility.

This cooperative care approach has achieved 40 percent savings in operating costs at New York University Hospital where it has been used for other kinds of patients since 1979. University of Nebraska Medical Center will be the first to adapt this model to the care of transplant patients.

We expect to improve the quality of patient care, increase patient satisfaction and lower cost by doing so. In addition, the integration under one roof of basic and clinical research and transplantation medicine will facilitate research that focuses on critical questions in transplantation and quickly translate basic discoveries into improvements in the care of patients.

The ultimate goal of this proposed complex is a provision of a unique environment for the development and testing of innovative practice models in transplantation. Such models are essential in order to provide optimal care for the maximum number of patients at the lowest associated cost.

Initial strategies would center on the model of cooperative care to provide as much care as possible in the lower cost setting. By optimizing the use of patient support systems, including family and friends to provide for the more basic care needs, many transplant patients could be moved out of the higher cost acute care setting.

The budget for the Transplant Center project is $42 million. We have approached the funding of the facility as a partnership effort including the Federal Government, the State of Nebraska and the university. We are confident that the Federal investment in this project will be very effectively leveraged against private and internal funds.

We have already secured private commitments in excess of $15 million and expect to raise another $12 million through internal funds.

The recent report from the Office of Science and Technology Policy entitled science in the national interest speaks eloquently to the need for Federal, State and private partnerships to fund academic research and education. We also believe this is critical.

The Nebraska Transplant Center will have a match from private and internally generated funds of at least 5 to 1, and probably significantly greater. The Federal Government's investment has been leveraged quite effectively in this case.

The delivery of quality health care and management of costly procedures is quite clearly a matter of national concern. A project such as the UNMC Transplant Center, which will be a resource for the Nation as well as the State, would be impossible to do with State support alone. This is why we have approached the funding of this expensive, though necessary, project as a partnership.

The university through private donations and self-generated funds will provide most of the funding for this project, and that probably is appropriate. But it is in my view entirely appropriate for the Federal Government to make an investment in this project which will provide significant benefit to the region and the Nation. We are grateful that Congress has made such an investment.

I appreciate the opportunity to provide information and will be pleased to respond to questions.

[The prepared statement of Ms. Aschenbrener follows:]

Statement
of
Dr. Carol A. Aschenbrener
Chancellor, University of Nebraska Medical Center
before the
Committee on Science, Space and Technology
United States House of Representatives
September 21, 1994

Chairman Brown, members of the Committee, my name is Carol Aschenbrener. I am the Chancellor of the University of Nebraska Medical Center. I am appearing before the Committee today in response to the Chairman's request that Dr. L. Dennis Smith, President of the University of Nebraska, appear. Dr. Smith is unable to be here today because of a scheduling conflict, and he asked that I express his regrets to the Committee. President Smith has been very supportive of the Medical Center's efforts to establish a transplant center, and he welcomes the opportunity, as do I, to provide information on the center to this Committee.

The University of Nebraska Medical Center has built outstanding programs in transplantation that provide comprehensive treatment for cancer and for diseases of the liver, small intestine, kidney and pancreas. Programs in heart and lung transplantation are being developed. The reputation of the programs and faculty attracts patients from across the United States and several foreign countries. In 1992, the liver transplant program treated patients from 22 states. That same year, the bone marrow transplant program treated patients from 36 states. UNMC is the transplant "center of excellence" for 23 insurance companies and managed health care systems. It is a regional and national resource. Since 1985, 877 bone marrow and 735 liver transplants have been performed on patients who reside outside Nebraska.

Basic and clinical research programs at UNMC have helped shape the field of transplantation. To address significant national concern with the economics of health care and to maintain UNMC's leadership role in research and clinical service, we believe we must find new ways to address the high cost of transplantation. UNMC has the expertise and the desire to address the issues of cost containment, outcome analysis, resource allocation and the dissemination of technology. From 1988 to 1993, the bone marrow transplant program experienced a decrease in the average length of stay from 51.1 days to 20.8 days. Similarly, costs associated with such transplants were reduced on average from $140,000 to $100,000. We believe that our faculty, through innovative practice and scientific breakthroughs, can continue to be world leaders in transplantation.

In order to address the significant scientific, economic and ethical concerns related to transplantation therapy, we have developed plans for a clinical and laboratory transplant research complex. In addition to serving the needs of patients from Nebraska and the surrounding region, this unique facility will be a valuable resource for the nation. The aims of the center will be to: 1) develop care systems that optimize the efficient use of medical facilities, medical personnel, patient personal support systems and innovative biotechnology to provide the best possible care at the lowest cost; 2) develop and standardize assessment of resource utilization and the quality of outcome; 3) provide an environment that will foster interaction among disciplines; and 4) develop health information networks that extend to the general public as well as the medical community. Such a complex could serve as a model to test and develop health care strategies for the twenty-first century.

The transplant center will pioneer a new, more cost effective approach to care of transplant patients by adapting the model of cooperative care to move patients quickly from the higher cost acute care hospital setting to the lower cost setting of cooperative care units and a day hospital located in the transplant facility. The cooperative care approach has achieved 40 percent savings in operating costs at New York University Hospital where it has been used since 1979. UNMC will be the first to adapt this model to care of transplant patients. We expect to improve the quality of patient care, increase patient satisfaction and lower costs by doing so.

The UNMC facility will be divided into four units: 1) cooperative care units for patients and their caregivers; 2) a large ambulatory care center for transplant and cancer patients, 3) offices and laboratories for personnel involved with research and clinical care of transplant patients; and 4) a health education center. The apartments will be equipped with medical supplies and air handling systems appropriate for immunocompromised hosts. The apartment's bell and light call-system will be monitored in the ambulatory care area. The ambulatory care area will be equipped and staffed as a day hospital. All aspects of transplantation care with the exception of critical care will take place in this area. The office and laboratory areas will be close to the patient care areas of the facility. Faculty working in all areas of transplantation will be grouped together to enhance collaboration. This integration under one roof of basic and clinical research in transplantation medicine will facilitate research that focuses on critical questions in transplantation and quickly translates basic discoveries into improvements in care of patients.

As the centerpiece of the facility, the health education area will have many purposes. A principal function will be to provide education and support to transplant patients and their families. In addition to providing an understanding of the transplant process we will teach patients, families and friends basic nursing skills that will allow them to assist with the medical care, thus minimizing the need for expensive skilled nursing care.

The second function of the area will be public education. We plan to focus on health practices that would prevent the kinds of illnesses that ultimately lead to organ failure. Examples of such programs include: vaccination for hepatitis B; alcohol, drug and tobacco withdrawal; management of risk factors for developing heart or lung disease; and innovative approaches to the early management of diabetes. Screening, genetic testing and counseling for persons at increased risk for organ failure or malignancy will be implemented.

The third educational task is the dissemination of new technology and knowledge throughout the medical community via distance learning and expansion of UNMC's existing computer linkage with practicing health care professionals.

The ultimate goal of this proposed complex is the provision of a unique environment for the development and testing of innovative practice models in transplantation. Such models are essential in order to provide optimal care for the maximum number of patients at the lowest associated costs. Initial strategies would center on the model of cooperative care to provide as much care as possible in the lower cost setting of the transplant center. By optimizing the use of patient support systems, including family and friends, to provide for the more basic care needs, many transplant patients could quickly be moved out of the higher cost acute care hospital setting. Working in close proximity with patients and with other researchers, faculty will continue to develop and implement biotechnology to improve outcome and contain cost.

The budget for the transplant center is $42 million. We have approached the funding of the facility as a partnership effort, including the federal government, the State of Nebraska, and the University. We expect that the federal investment in this project will be very effectively leveraged against private and internal funds. We have already secured private commitments in excess of $15 million, and we expect to raise another $12 million through a revenue bond offering.

I am aware that this Committee has been concerned with the earmarking of federal funds for academic research and research facilities. Regardless of one's views on earmarking, it is clear that there are areas in which peer-reviewed funding programs have been inadequate to support the research the nation requires. One example of this is the funding of academic research facilities.

Until about 20 years ago, federal agencies supported competitive grants programs for facilities construction. In 1968, approximately 30 percent of annual expenditures for science facilities came from the federal government. In a recent year, the National Science Foundation estimated that only about ten percent of such expenditures came from the federal government. The deficiency resulting from the lack of federal attention is quite significant. Estimates of the unmet needs for repair, renovation and construction of academic research facilities currently exceed $10 billion. The greatest need, according to NSF, exists at medical schools in the areas of biological and medical sciences.

Currently there is only one authorized major federal competitive facilities program, the Academic Research Facilities Modernization program administered by NSF. While this program is designed primarily for repair and renovation, much of the facilities needs are in new construction. Thus even if this program were funded, it would not likely address new construction needs such as the UNMC transplant center. In any event, as you well know, congress has only partially funded the facilities renovation program.

Nebraska, and I expect most other states as well, would find it impossible in the current environment to fund a state of the art transplant research and clinical facility. Entitlement programs and other federal mandates have taken a toll on state budgets. When Nebraska's legislators convene in January they expect to spend much of their time grappling with a deficit due in large part to federally mandated expenditures. Moreover, when research or other activities are designed to benefit the nation, local and state governments cannot be expected to foot the entire bill.

One of the features of the NSF facilities program that has been extolled is the 50 percent matching requirement. Similarly, the recent report from the Office of Science and Technology Policy, entitled "Science in the National Interest," speaks eloquently to the need for federal, state and private partnerships to fund the academic research and education enterprise. We believe this is critical. The Nebraska transplant center will have a match from private and internally-generated funds of at least five to one, and probably significantly greater. The federal government's investment has been leveraged quite effectively in this case.

The national transplant center at the University of Nebraska will be a health care facility which will provide the opportunity for research. I am not aware of sources of competitive funds for such projects. Perhaps there should be. But in the absence of a viable competitive source, I believe it is appropriate for the University of Nebraska Medical Center to seek an investment from the federal government in what will be a national resource. In fact, I would suggest that the federal government has a responsibility in this arena.

The delivery of quality health care and the management of costly procedures is quite clearly a matter of national concern. A project such as the UNMC transplant center, which will be a resource for the nation, would be impossible to do with state support alone. That is why we have approached the funding of this expensive--and I believe necessary--project as a partnership between the federal government, the State of Nebraska, and the University of Nebraska. The University, through private donations and self-generated funds, will provide most of the funding for this project. And that probably is appropriate. But it is, in my view, entirely appropriate for the federal government to make an investment in this project which will provide significant benefit to the region and the nation. We are grateful that the Congress has made such an investment.

I appreciate the opportunity to provide information to the Committee on this matter, and I would be pleased to respond to any questions you may have. Thank you.

The CHAIRMAN. Thank you very much.

We will move into some questions. But before we do that I would like to recognize our ranking Republican member, Mr. Walker, for whatever opening statement he may wish to make, and he may start the questioning if he likes.

Mr. WALKER. Thank you, Mr. Chairman. I did have an opening statement here that I would ask unanimous consent be made a part of the record.

The CHAIRMAN. Without objection, so ordered.

Mr. WALKER. One can't help but be impressed by the nature of the projects that you describe, and there is no doubt that good work is being done with the money that you have received from everything that you have told us here today.

But in the case of the projects that you told us about and talked to us about, did you seek money through the peer review process before going the earmark route? Yes, sir?

Mr. IHLANFELDT. My response to that is that there was no process to achieve that objective. Facility funding simply was not available in the mid-'80's. It had been available in the '60s and early '70s, but money was no longer appropriated for that purpose.

Mr. BLOOM. I would have the same response. I mean the main part of our project is capital cost and infrastructure development, and we did not know of available other funding.

Ms. ASCHENBRENER. Likewise, there was no appropriate peer review mechanism.

Mr. WALKER. Well, I thank you for that response, but then that follows up the question with a question of is it not possible that there are institutions that have just as worthy goals and programs that would also like to find capital monies from the Federal Government?

I mean I think we can assume that you are not the only institutions in the country that have those needs. Is that a rational assumption?

Mr. IHLANFELDT. Well, I think that you'll note in my testimony that I think we have been able to identify through various surveys—NSF, ACE, et cetera—that the needs are in the billions of dollars, and they range from a low of $25 billion to a high of $100 billion. So, we're talking about a serious problem facing this country in order to maintain our science and engineering infrastructure.

Mr. WALKER. Well, I would agree with that, and my point is, though, that if there is no peer review process utilized, then the question becomes what's the sorting out process for those who have a variety of needs?

I mean you've identified the needs that you have. You've identified excellent programs that you are running utilizing the facilities that were purchased, but the fact is that the sorting out process is reasonably esoteric if you are—if what you are using is political clout as the way of arriving at the decision.

I mean how was the money prioritized in the case of the programs that you are raising with us today?

Mr. BLOOM. How was it prioritized by?

Mr. WALKER. Whoever gave you the money. Where did we decide that what you wanted to get was by far the singlemost important item of the $25 billion of need that exists in the country?

Mr. IHLANFELDT. Well, I'll try my hand at that.

Mr. WALKER. OK.

Mr. IHLANFELDT. I suspect that we're not talking about three institutions, we're talking maybe 40, 50, 100.

Mr. WALKER. Right. My problem is this, and just to preface it, whether we went back and looked—I mean the story has always been made that the reason why you come to do this is because it separates the haves and the have-nots and the have-nots are able to pick up some money this way.

When you go through and look at what happened, the Congressional Research Service has done it and found out that the top ten State recipients of peer reviewed research dollars are also the top five beneficiaries of academic earmarks.

So, the sorting out process is not being done on behalf of haves and have-nots, you know. It is being done in a way that leads to somewhat similar results. And for the life of me, I don't understand how it is being appropriately prioritized.

Mr. IHLANFELDT. I think that is a committee process, in essence. And it seems to me that the idea of intrinsic peer review with no inclusion of an extrinsic kind of evaluation is not the wave of the future, and that what we have to do is develop some kind of a new system which includes both in that process.

If not, I suspect that Congress among itself will continue to debate this issue, and educators as well.

Mr. WALKER. Well, for example, did any of you use a lobbying firm in order to come to Capitol Hill with your request?

Mr. IHLANFELDT. We did. And rather than having an office in D.C. like many of our peer institutions, we elected to out-source most of our consulting and lobbying to a firm in D.C.

Mr. BLOOM. We have no firm in D.C.

Mr. WALKER. And do you have an office here?

Mr. BLOOM. No.

Mr. WALKER. OK.

Ms. ASCHENBRENER. We did not use a lobbyist, and we do not have an office here.

Mr. WALKER. OK. In the case of where you did not use a lobbying firm, were there particular Members of Congress then that you came to and worked directly with?

Mr. BLOOM. We've discussed our needs with all Members of Congress in our delegation.

Mr. WALKER. So you——

Mr. BLOOM. And with others. I mean we have no secrets about the needs of our institution or other academic——

Mr. WALKER. My point is not to be accusatory here of even the lobbying process. I'm trying to get some idea as to how we're doing the sorting out process.

Because our problem is—as a committee is that we think we have some understanding of some of the national scientific needs. We are not positive that those get addressed in a process which is largely ad hoc, where some institutions have an ability to come and hire lobbyists who then contact certain powerful people who are able to get money put in who knows where in the process. Others happen to have a very powerful member of their State delegation who is able to get money put in on an ad hoc basis.

We are not certain that we are ending up with national needs being appropriately addressed. It may well be that there are very good programs being funded through that mechanism, but to the exclusion of other very good programs that simply didn't have that level of clout or that level of lobbying capability within the system.

And I for one am just not certain that that is a process that ends up serving our needs very well or in the end ends up addressing our scientific priorities very well.

Mr. BLOOM. I mean this is not our process. We are struggling with our institutions to grow and develop and take care of our, in our case as a health sciences university, to take care of our patients, to train people, to be a regional institute for people all over our State. I mean those are our tasks, and we have to look to every way we can to try and meet our goals.

Mr. WALKER. Yes——

Mr. BLOOM. So, it is not our process. I mean we're basically talking about the fact that you have a very underfunded system here that you are trying to cram most of the science into and it leaks out around the edges because it is inadequate.

Mr. WALKER. But you understand, I hope, where I'm coming from. Your program and that at Nebraska are both earmarked for $5 million from DOE's Health and Environmental Research programs. The bottom line is that somebody else's research is going to have to be cut in order to come up with those earmarks.

We're operating with limited amounts of funding here too. The fact that you get your earmark put in doesn't mean that there is that much more money that has been allocated. It means that someone else's research program is going to get cut.

And the question is what's the priority determination that goes into that?

The CHAIRMAN. Would the gentleman yield briefly?

Mr. WALKER. Sure. I'd be happy to yield.

The CHAIRMAN. You weren't here this morning and which we had the testimony from the Department of Energy with regard to programs that were cut. And while the witness couldn't provide a list, we happened to have a list, about 6 pages of projects that have been cut in order to fund earmarks, and that is inserted in the record for review.

All of you were here this morning, were you not? You wouldn't like to see some other institution get cut just to fund your program, would you?

Don't answer that question. [Laughter].

Mr. WALKER. They didn't look like they were rushing to answer that question.

But I mean that is our concern. And the chairman has been more than generous with the time here. But the earmarking process then is not only—we have had earmarks, and not necessarily in some of these fields, but we have had earmarks in the past where the institution didn't know what the money was for until they were called by the press and told that the earmark is there, what are you going to use it for? And they said, Well, it is wonderful we're getting the money. I'm sure we will find a good use for it.

Now, my guess is that the prioritization process that ended up doing that is not one that very many academic research institutions could support.

Ms. ASCHENBRENER. I might speak—try to address your question about prioritizing and say that the priority setting for our project first comes from within the university itself. There are at the University of Nebraska Medical Center really only 5 specific areas in which I intend to build programs in a substantial way.

All of them build on existing strength. All of them are areas that currently have peer reviewed funding for programs. All of them are areas that address important needs of the people that we serve.

Those are—there is the same short list of priorities when I approach a congressional delegation, when I approach State government, when I approach private donors that is our focus.

I believe that this project is a very important one. I believe it is one that serves a group of people far beyond the borders of the State, and that it is worthy of some Federal investment.

Mr. WALKER. But, well—and my guess is that a lot of academic research institutions go through that same process. I mean that is a fairly standardized process. But my guess is that you in Nebraska would get real concerned if you took a look at the committee structure and figured out that in Pennsylvania, for example, we have some very powerful people in charge of the various Appropriation Subcommittees who can make some of these determinations, and they just decide as a matter of form that the process that was used by the Pennsylvania institutions just happen to be more to their liking than the process that was used at your university. You get nothing and they get a lot.

And that is great for those of us in Pennsylvania, but it doesn't serve the prioritization for the rest of the country very well. Now, if we lose our seniority and some other State comes in, then they get their chance. But that still doesn't give us the kind of basis for making fundamental scientific decisions that at least this gentleman believes is necessary.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Mr. Walker.

Mr. Walker has put his finger, I think, on the key thing that we're approaching. It has nothing to do with the quality of your work, and you properly say that you followed a process that wasn't your process, it was our process. You went to where the money was.

It is like, was it Willy Sutton who asked why he robbed banks, he said, "That is where the money is." And, in effect, you have robbed banks because that is where the money is.

Now, I don't want to make that too pejorative. You went to a powerful member of the Appropriations Committee who, acting without authorization of the rest of the Congress, attached an earmark to a bill in order to fund your project.

There is nothing illegal about it. In fact, it has no legal significance at all that he earmarks it. But the departments fund the money. You heard the testimony this morning. They fund it because they don't want Appropriations Committee members mad at them.

Now, the problem with that is that it follows no rule of law or logic. For example, in the case of Illinois, when Mr. Yates retires, if he ever does—I think he is immortal probably—but if he ever does, Illinois is going to have a little bit more difficulty getting earmarks in appropriation bills.

Now, as long as you are aware of that and are willing to see a 50-year drought before you get another senior member of the Appropriations Committee from Illinois, fine. But I want you to look at this in a long-term perspective of what is in the best interest of the whole country.

When you say that you petition the Congress, you don't really mean you petition the Congress. You mean you petition an influential member of your State delegation who is on the Appropriations Committee.

Now, again, that is not your problem. That is the Congress' problem. But we're using you to illustrate the need for a broader perspective on this more than anything else.

You have a heart transplant operation at Nebraska. I have one of the finest in the world about 10 miles from where I live. If I wished, I could ask for Federal funds for that. I haven't and as far as I know that center hasn't.

I wrote a letter for them yesterday asking merely that they be certified by Medicare so that they can get payment for the poor patients that they treat there, and they treat hundreds of them.

But the point is does your Transplant Center, is it entitled because you have a Senator on the Appropriations Committee to more concern than the transplant center 10 miles from my home which does not have me on the Appropriations Committee? Is there a mechanism to adjust this, and there isn't.

There are problems with that kind of a system, as you know. A lot of academic organizations have eschewed this particular kind of process because it doesn't uniformly produce the best science. We brought you here because you are producing good science. And we want the earmarkers to know that we are not condemning the process because it produces bad science. We're condemning it because it is inequitable, it is unfair, it doesn't proceed through a process which ensures that it even meets the goals that the Federal Government has set.

I haven't yet figured out why the University of Oregon has to get money for a telemedicine center from the Department of Energy when you have got a program over at the Library of Medicine that does it. I think the reason is that you have a very powerful Senator who sits on the Energy and Water Subcommittee and he goes where the money is. It is easier for him to earmark money from the Department of Energy than to go where the money should come from.

Am I being unfair?

Mr. BLOOM. I don't know the process that well, Mr. Chairman.

The CHAIRMAN. Well, I'm trying to help you understand it.

Over on this side, Mr. Minge, do you have any questions?

Mr. MINGE. I would echo the comments that have been made. I've observed this with some interest over the years both in and out of Congress, and I'm intrigued.

At Northwestern you have a $12 million project that is being funded out of the U.S. Department of Agriculture, and as I understand it, you have not received nearly enough in terms of funds to complete the facility at this point, so it's under construction.

What happens if the Federal Government does not come up with the rest of the money? That is, what happens if the Appropriations Committee is unable to find that additional funding?

Mr. IHLANFELDT. Well, just to clarify, we have debt financed a good part of that at this point in time, and it simply means that we will have to raise more than the match that we had agreed to. The total cost is around $24.4 million, and we had agreed to come up with $12.2 of that.

So, our request or our responsibility or liability would simply increase, and it would take us that much longer to complete it.

Mr. MINGE. Would you build that facility without the Federal match?

Mr. IHLANFELDT. We already have in the context of debt financing it.

Mr. MINGE. Would you have built it without an anticipated Federal contribution to the extent of the $12 million?

Mr. IHLANFELDT. Probably not.

Mr. MINGE. I'd like to follow up with a question that was asked. If we here in Congress are trying to both deal with the deficit and responsibly deal with the allocation of scarce dollars among universities, all of whom are clamoring for funding, what would you recommend that we do in order to avoid the use of essentially the political process and the longevity of Members of Congress to determine which institutions obtain funding?

And you are in a somewhat vulnerable position, because if the chair of the Ag Subcommittee of Appropriations moves over to another subcommittee you would no longer have a member of the Illinois delegation that has that ability to help you out with money that is needed for your facility.

Do you have any suggestion as to what we ought to do?

Mr. IHLANFELDT. Well, first of all, I think we have to recognize and somehow fund a much larger appropriation for facilities, particularly science facilities, nationwide. I think secondly there has got to be extrinsic as well as intrinsic review of the needs of a particular proposal as it relates to the society or the region in which it is located.

That is not unlike what USDA does today. Now, they do make recommendations back to Congress in terms of their peer review process. Now, whether Congress listens or not is another question. But they do prioritize projects as well based upon that peer review process.

So, they do bring to the system a new way of doing it—actually, it is an old way because they have been around and have been doing it for some time. It is just that agriculture has been looked at in a sort of asymmetrical way in contrast to the rest of science.

Mr. MINGE. Would you then suggest that if Congress were able to increase the level of appropriations for these research facilities in the aggregate that we could bring some integrity to this process and use a peer review process for the allocation in its entirety.

The CHAIRMAN. Would the gentleman yield to me to amplify on that thought?

I think you pointed out, Dr. Ihlandfeldt, that there is a shortage of peer reviewed funding, and you probably know and we know full well that the Administration—this is the Reagan-Bush Administration, asked for a new competitive agriculture research initiative that was based on the findings of the National Academy of Sciences actually, recommended $150 million per year at one point—I don't know what this year's was—in competitive funding and the Congress never approved it.

The Appropriations Committee and its distinguished members and the Subcommittee on Agriculture preferred to earmark funding for programs rather than to put them through the competitive peer review process. Now, that is a flaw on our part, not your part. But unless we work together on these kinds of flaws, the tendency on the part of Members of Congress is to do just as you do. If they can appropriate money and get some benefit in their district, they do it. They write it into an earmark.

And we've got to do what we're doing here, shed a little public light on this process in order that we can all work to achieve a better system.

Forgive me for that interruption.

Mr. MINGE. No. Well, that is—and that is essentially what I'm trying to reach for. In large part, this is an internal struggle within the Congress, as you well know. And if we are able to come up with an appropriation for the aggregate for university research facilities that is reasonable given the needs that you have been talking about in both your prepared testimony and now in the question and answer period, I sense that you feel that we could use that peer review process and maintain some integrity in the system.

Mr. IHLANFELDT. Well, I do. I can't speak for my colleagues.

Mr. MINGE. Well, what about the rest of you?

Ms. ASCHENBRENER. I will comment on that. I think more funding for research facilities is a much needed and very important step forward.

I would have to say I think that probably that in itself would not be totally sufficient. I think earlier Dr. Ihlanfeldt made some mention that perhaps we need more than one kind of mechanism. I believe very much in peer review, but we sometimes talk about the peer review process as though it is a single giant hopper into which any good idea can be submitted for filtration, and, in fact, it doesn't operate that way.

I would speak only about the NIH process, the one with which I am familiar, and that is there are gateways where certain kinds of ideas can be submitted for peer review. I mentioned there is no route of submission for a transplant center.

And so even were there much more money to fund facilities, it is still likely, I think, that it would not be structured in such a way so that all good ideas could be funneled in. So if, for example, there was generous funding for facilities and it didn't have a route for transplant centers to be submitted for peer review, I really believe this is a wonderful idea that can have wide benefit and I would have approached it in the same way.

Mr. MINGE. Well, perhaps I could return to the Northwestern situation, both because I went to school in the City of Chicago and have some interest in what goes on in the area, but in addition because you've used an outside consulting firm.

Let's assume that what Congress does is comes up with 10 percent of the money that is needed for academic facilities nationwide. So we have several hundred institutions chasing this 10 percent of the money.

And let's assume that each one of them tries to become as conversant with the system as Northwestern and decides to hire a consulting firm and go after this money.

Are we, in effect, in this country at that point spending too much in terms of our resources at academic institutions even trying to chase scarce resources, and maybe we'd be better off if the Federal Government just shut down funding entirely rather than having you spend several thousand dollars and on a nationwide basis perhaps millions of dollars chasing millions of dollars.

That is kind of a statement, but also I'd like to just have your response to it, and not trying to put you on the spot so much as looking at this from the outside on the broader scale, what would your comment be?

Mr. IHLANFELDT. Well, certainly it is a conundrum. You're on the horns of a dilemma. But I should add that one of the things that we can't overlook is that universities are very much an extension of their municipalities today, and the pressures to stabilize their economies and to become much more active in transferring technology and assisting the formation of new companies is quite a different role than what we have had historically over the last 40 years. And those pressures are not going to go away simply because we would set up a system that you just defined.

If we look at how municipalities receive funds, they very much receive it the same way educational institutions have in terms of the ones that are before you, and I'm not sure that is going to change in the near future. And the pressures that municipalities place on educational institutions or the States place on educational institutions is not going to go away in terms of the future, because the future is in becoming much more competitive, being able to participate in the global economy. And each State is there to get its fair share, and that fair share may be a disproportionate share depending on where one sits or stands.

Mr. MINGE. So, we're just saying this is an inevitable by-product of the process, if you will, in Congress and in our country?

Mr. IHLANFELDT. Well, I think the process could be improved upon, and I have made a suggestion along those lines. However, as long as there are some people on the outside looking in, they are going to try to use the—or petition Congress as they have historically.

Mr. MINGE. What would you estimate it costs Northwestern a year to maintain the sort of lobbying or consulting firm that you need in order to keep abreast of the opportunities that exist in seeking funding in Congress?

Mr. IHLANFELDT. We would estimate probably between $300,000 and $400,000 a year.

Mr. MINGE. Would you, based on your experience at Northwestern, think that similar expenses are being incurred by, let's say, at least 50 other major universities around the country?

Mr. IHLANFELDT. I would say more than 50.

Mr. MINGE. How many would you estimate?

Mr. IHLANFELDT. Probably a couple hundred.

Mr. MINGE. So, if it is a couple hundred times $300,000—I'm not sure my math is going to get there quickly enough—we're talking about $60 million?

Mr. IHLANFELDT. Well, I—that is your number, Congressman.

Mr. MINGE. Yes. Well, I'm just trying to extrapolate from——

Mr. IHLANFELDT. I just think that there are a lot of institutions that, either at the State level or at the Federal level, are extremely active petitioning either the legislature or Congress. And the closer home one gets the smaller the institutions participating in the petitioning process.

Mr. MINGE. Well, I thank you for engaging in this discussion, and hopefully it will shed some light on how we should operate here in Congress.

The CHAIRMAN. Thank you, Mr. Minge.

Mr. Fawell?

Mr. FAWELL. Thank you, Mr. Chairman. One learns something everyday. I think the figure that was just brought out, a couple of hundred institutions spending on the average $300,000?

Mr. IHLANFELDT. No. I said there are—and let me clarify that. There are probably at least a couple hundred institutions that are engaged in lobbying activities. The amount, I am not prepared to endorse the figure that was presented.

The CHAIRMAN. Would the gentleman yield briefly?

Mr. FAWELL. Yes.

The CHAIRMAN. The top figure that we have for our most prestigious lobbyists is $60,000 a month, which is—would be $720,000 a year. Three hundred thousand as an average is probably not too far off.

Mr. FAWELL. Well, it is a difficult situation, and I certainly understand all of you taking the path you have taken. I guess that is a kind of free enterprise when you don't have private enterprises involved in determining what the peer review process might find are the needs for America.

You have indicated several times that the needs are anywhere from $25 billion to $100 billion for science and engineering needs, basically, I gather, capital structure primarily, which is just a portion of the needs.

Where did you get that figure?

Mr. IHLANFELDT. Well, there have been surveys made by various Federal agencies as well as ACE.

Mr. FAWELL. What we have, obviously, is there is no real private sector, I gather, such as the Academy of Sciences and others that are, or a banning together by higher educational institutions to try to recommend to Congress, not that Congress through its administrative branch should not be doing the same thing, as to what our national needs are and how we best can collectively set about to get the job done.

We are, obviously, on an ad hoc basis, every person for himself or herself, and whoever may indeed have a fortunate situation of one who has high seniority, and also I would say the correct party, on an Appropriation Committee will be the one that has the chance of striking it rich and being able to get for your institution what you feel you'll need. As I say that, I can understand that circumstance existing.

But it is a devilish situation we face. As co-chairman of the bipartisan pork busters group, we evolved because of the situation. We never envisioned the idea that we would try to identify pork. We did envision that what we would try to do every year, because the appropriation bills go flying by so fast, hundreds and hundreds of pages evolving all kind of complex descriptions that nobody has the time to look at, that we thought that, Well, we can wait.

And after the appropriation process is done, when the dust is settling, we got together with a group of taxpayer groups and many other private entities as well as Members of Congress to determine what in the world is being funded out there. Because nobody really knew.

And we looked at the process, and we said that, look, if there has never been a hearing where there is some peer review and analysis, even of individual projects that might come from higher educational institutions, then it is suspect. And, if you have something coming out of a conference committee when the House and the Senate bill that go in have dealt—did not even deal with a particular appropriation that ends up being funded, as in the VA–HUD bill, for instance. All of a sudden 290 new research grants. I mean just special grants, not research. But 68 million of that research, scientific research just suddenly is born. No hearings. No process. Nothing. It is just who gets there firstest with the mostest and is able because they happen to have representation on that particular conference committee.

In organizing our group, we tried to look at the process, and we say if the process is not being used, scrap it, do it the right way, have a full authorization hearing and analysis, and then if the authorizing committee says yes, this is a good project for Topeka, Kansas, or Everett, and so forth and so on, then at least it has gone through the process—at least. No overall policy, perhaps, as it ought to be.

And we did that for a number of reasons. Even right now as I look at the debt and deficit problems in this country, even following Mr. Clinton's figures, taking those for gospel—the gentleman assumed the Presidency and there was a $4.1 trillion national debt. Using his figures and CBO figures, the debt will be 6.3 trillion at the turn of the century, and some 300 billion per year now just to pay interest on the debt. It will be over 400 billion, assuming we keep low interest rates.

And worst of all, Congress has absolutely no plan to balance the budget this century or the next century. We felt that this ad hoc approach to budgeting and things of this sort was part and parcel of all of that. And so we introduced the concept. It got the nickname pork busters. I never have quite liked that name myself.

And by George, you are like the skunk at the picnic at times. And there are some good "bring home the bacon" people in Illinois who have really criticized me, for instance, because I take that view.

But something certainly has to be done where the private sector, and that means all of the science, scientific private sector entities, and they are out there, and I think they would be willing to set and make recommendations to Congress in reference to how much money should be spent and where and what there is and so forth. Not site specific, but things of that sort.

If we don't do this, this country is simply going to be monetizing its debt and there is going to be grave reactions as a result of it. I believe that in my heart. I wouldn't have been laboring so long on this.

You are spending a lot of money for lobbyists and all of that, and it would seem to me that it behooves all of us in the private sector to really look at what we think the policy of this Nation should be and in what degree does the Federal Government partake, what degree the State governments partake.

If we're all in it for ourselves with the greatest and highest and noble reason, we're doing what no sound business would do. You folks start out with peer review. You don't make a step without peer review and analysis. Then you go. But then you dash right into what you know is something that has no guidelines, no boundary. It is just who you can convince to be your champion.

And you end up with, I'm sure—I know Northwestern University is an exceptionally fine university.

I've just—Mr. Chairman, I apologize.

The CHAIRMAN. Yes.

Mr. FAWELL [continuing]. For speaking in generalities, but this is what our chairman is all about. He is trying to zero in on this, and he takes a lot of sharp blows also. If the gentleman is the new chairman of the California delegation——

The CHAIRMAN. I'm going to use that power for a lot of earmarking.

Mr. FAWELL. Well, I hope you don't. I know you will not leave the area where you are.

Again, I don't have all the answers, but I do know Congress has to address itself in sound budgeting in general numbers, and delegate especially in science above all, delegate to our agencies. That is not perfect, but it is much better than 535 Members here all elbowing and trying to get into the trough and so forth.

Thank you very much.

The CHAIRMAN. Thank you, Mr. Fawell.

Mr. Bloom, I understand you—Dr. Bloom, I understand you have to leave. We didn't mean to keep you here unduly.

I will put in the record a sheet showing Oregon Health Sciences academic earmarks from 1983 to 1995, and you'll be pleasantly surprised that it is well over $100 million, runs about $10 to $12 million a year on average, and that is a very healthy source of Federal support.

Now, you are not nearly in that category. You are about half that over the same period of time.

Nebraska is just getting started. And, of course, now that you know how well other good universities can do, you may want to get in there and try to match what they have achieved. I hope you won't. But, now that you have seen the good example that they have set.

And you are excused, Dr. Bloom, if you wish to go.

Mr. BLOOM. How much longer are you going to stay?

The CHAIRMAN. Just long enough for Mr. Rohrabacher——

Mr. BLOOM. I'll stay.

The CHAIRMAN. Okay.

Mr. ROHRABACHER. Mr. Chairman, I'm sorry that I have missed a substantial part of this meeting. As usual, Members of Congress are scheduled in three or four different meetings at the same time.

I would like to just say here at the end of this meeting that I know about this issue. I've worked with the chairman on it. I share not only his concern, but his absolute commitment to try to right what is a wrong situation.

In his opening statement the chairman talked about the system that we use to spend money. When we spend money out of what is the approved system, what is the way that our system is supposed to work, we are basically disenfranchising the rest of the Members of Congress.

And the chairman has worked with me on appropriations reform of the process which would basically try to bring more responsibility in the process. Absent that fundamental reform that is needed in the House, I will say that Chairman Brown is providing this kind of leadership which is, if we are ever going to cure this out-of-control spending, it is going to be because of the type of leadership Chairman Brown is offering today and the example he is giving to the rest of us.

And Congressman Fawell, who has been—is a legend among those people who are trying to be responsible here and trying to get control of this out of—runaway spending.

I am just very honored to be with you both. I'm sorry that I couldn't have spent more time with you. I endorse everything you did today.

So, thank you.

The CHAIRMAN. Thank you, Mr. Rohrabacher.

We may have failed to not make a rather simple point. Under the rules of the House, appropriations have to be made in accordance with authorizing legislation. What you do in the earmarking process is doubly iniquitous. None of the projects are authorized. That means reviewed by another committee. If the earmark is in the bill it requires that the rules be, in effect, waived. And so instead of doing that they put the earmarks in the report where it has no force of law, and if I'm successful in persuading the Administration they will direct the departments not to fund them.

I haven't been successful yet, so don't start worrying too much. But the problem is one of procedure, and I'm trying to make that point, rather than the quality of the research. It is spottier, but in your case it's all very good.

And we are trying to correct the situation that you described so well, Dr. Ihlandfeldt. That there was not adequate funding for facilities. What happens, the appropriators—we've authorized a quarter of a billion dollars a year just for NSF to do facilities funding. Appropriators say they don't have the money, so they don't fund it.

Instead they fund three quarters of a billion dollars in earmarks. We don't think that is very good.

But that is not your problem. That is our problem. And I don't want to put that load on you. I just want you to understand it.

Any concluding comments? And after that we will adjourn this enlightening session.

Mr. BLOOM. I would say one thing. I am certainly sympathetic to what you are trying to do, trying to accomplish. I think, however, that we're looking at a tiny piece of the problem, and I think what we need is some reconciliation government where we actually together address priorities. You've got your committee and you've got universities, great and otherwise, coming in here and we're at cross purposes over the fact that the universities are in trouble. And we are in trouble from a number of different sectors.

And you present an extremely logical point of view, but it doesn't get at the basic problem, which is what kind of universities do we want and how do we want to fund them and how are they going to be successful in a global economy? And I think that, you know, we can sit here and take the heat for what we've done or whatever, but until we have a governmental system that functions together and does identify the problems I don't think we're going to get to where any of you want to get to or where any of us want to get to. We're public officials too with responsibilities, and we're not getting to where we want to get to, I can tell you that.

The CHAIRMAN. Your comments are well—very well taken, Doctor. And let me assure you that we focus on this broader picture all the time.

But we can only do one thing at a time and one thing at a hearing, and right now we're focusing on this in order to attack the broader problem more effectively.

Without objection, the record will remain open for 30 days to allow additional materials relevant to this topic to be submitted.

And I wish to notify all witnesses appearing before the committee today that we may wish to submit additional questions from the committee or request for the documentation to make a more complete record. We will make those requests to you in writing and we hope you can cooperate with us.

And the committee will now stand in recess until 8:30 tomorrow and which we will take up another similar situation and try to enlighten the public a little bit more.

Thank you very much.

[Whereupon, at 1:15 p.m., the committee was recessed, to reconvene at 8:30 a.m., Thursday, September 22, 1994.]

APPENDIX A

Department of Energy
Washington, DC 20585

NOV 28

November 23, 1994

The Honorable George E. Brown, Jr.
Chairman
Committee on Science, Space, and Technology
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is the edited transcript of the testimony given by Dr. Martha A. Krebs, Director, Office of Energy Research, on September 21, 1994, regarding Academic Earmarks, Part III.

The inserts requested by you and Congressmen Boehlert and Fawell are being prepared and will be forwarded to you as expeditiously as possible.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Barbara Campbell, on (202) 586-8238.

Very truly yours,

William J. Taylor, III
Assistant Secretary
Congressional and Intergovernmental
Affairs

Enclosure

And what is particularly disturbing to any of us that have an investment in that is that this other process that is sometimes good overall and supports an appropriate kind of governance is set against that. And it is part of my job and some of the other people at this table to try and walk along the middle of that, as it is yours. And I don't have any good advice for you.

Mr. FAWELL. I understand. I guess somehow we have to make it clear that whether there is site specific instructions that no agency can feel that they should abandon the peer review process to determine what site ought to be used regardless of what Congress may throw in that report language, and we aren't able to do that at this point, human nature being what it is all over.

But I am more concerned, I guess, about whether or not this sort of ~~--the word slavish reaction, that is not quite fair either --that we have to~~ a site specific earmark, for instance, may actually be carried so far that you have then detriment to peer review legislation.

I understand that the Department of Energy, for instance, has decided, allegedly arbitrarily, to cancel the $5 million of awards in Fiscal Year 1994 for the university research instrumentation program. And these funds for this competitive merit-based program, I am told, were explicitly requested by the Administration and explicitly appropriated by Congress.

I also understand that this funding was canceled in order to cover a $5 million earmark included in report language, and apparently this was all done without a formal reprogramming request to Congress.

I'd like to know if you do have knowledge of that. If not, we can be certainly advised upon your analysis. But if so, then the question is what is the rationale and justification for the Department's action and how can one justify diverting congressionally approved funds in this manner?

~~Ms.~~ DR. KREBS. I'm going to have to provide you with information on the record because I don't have personal knowledge of that.

Mr. FAWELL. Are you aware of other cases where that may have occurred?

~~Ms.~~ DR. KREBS. Not ~~that you know,~~ in such circumstances as you describe.

Mr. FAWELL. If you could look into that, because I have had several people speak to me on this and are concerned about it. They believe that this occurs, unfortunately, too often.

Thank you.

The CHAIRMAN. Thank you very much, Mr. Fawell.

Mr. Minge?

Department of Energy
Washington, DC 20585
December 15, 1994

The Honorable George E. Brown, Jr.
Chairman
Committee on Science, Space, and Technology
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

On November 23, 1994, we sent you the edited transcript of the testimony given by Dr. Martha A. Krebs, Director, Office of Energy Research, regarding Academic Earmarks, Part III.

Enclosed are the inserts requested by Congressmen Boehlert and Fawell to complete the record.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Valerie Adams, on (202) 586-2032.

Very truly yours,

William J. Taylor, III
Assistant Secretary
Congressional and Intergovernmental
Affairs

Printed with soy ink on recycled paper

COMMITTEE: House Science, Space and Technology Committee
DATE: 09/21/94
WITNESS: Martha Krebs
Page 36, Line 793
Page 40, Line 847

INSERT FOR THE RECORD

Section 111(b) of the Energy Reorganization Act of 1974 (Pub. L. No. 93-438), 42 U.S.C. 5821(b), authorizes the use of funds appropriated for operating expenses for construction or acquisition of any facilities or major items of equipment that may be required at locations other than Department of Energy installations for the performance of research, development, and demonstration activities. Grants may also be made to an organization for purchase or construction of research facilities. Further, if the Secretary of Energy determines in writing that the research, development, and demonstration, for which such facilities or equipment were purchased, would best be implemented in an entity other than the United States, the Secretary may approve the vesting of title in that entity after laying the determination before appropriate committees of Congress for a period of thirty calendar days. This period may be shortened, if prior to its expiration, each such committee transmits to the Secretary of Energy written notice that the committee has no objection to the proposed action.

COMMITTEE: HOUSE SCIENCE, SPACE AND TECHNOLOGY
DATE: OCTOBER 31, 1994
WITNESS: MARTHA KREBS
PAGE 43, LINE 929

INSERT FOR THE RECORD

In response to the committee request, attached are copies of proposed earmark rescissions submitted to the Congress for FY 1987. Of the proposed rescissions, none were enacted into law.

OFFICE OF MANAGEMENT AND BUDGET

Budget Rescissions and Deferrals

To the Congress of the United States:

In accordance with the Impoundment Control Act of 1974, including section 1014, I herewith report 73 new rescission proposals totaling $5,839,301,314, three new deferrals of budget authority totaling $28,716,462, and three revised deferrals of budget authority now totaling $34,850,024.

The rescissions affect programs in the Departments of Agriculture, Commerce, Defense-Military, Defense-Civil, Education, Energy, Interior, Justice, Labor, and Treasury, the Environmental Protection Agency, the National Aeronautics and Space Administration, the Veterans Administration, the Appalachian Regional Commission, the National Endowment for the Humanities, and the Selective Service System.

The deferrals affect programs in the Departments of Defense-Civil, Energy, Interior, and State.

The details of these rescission proposals and deferrals are contained in the attached report.

Ronald Reagan,
The White House,
January 5, 1987.
Billing Code 3110-01-M

ESCISSION NO.	ITEM	BUDGET AUTHORITY
	Department of Defense - Civil:	
	Corps of Engineers - Civil:	
R87-24	Construction, general	7,715
	Department of Education:	
	Office of Elementary and Secondary Education:	
R87-25	Compensatory education for the disadvantaged	7,500
R87-26	Impact aid	17,500
R87-27	Special programs	54,980
	Office of Bilingual Education and Minority Languages Affairs:	
R87-28	Bilingual education	45,886
	Office of Special Education and Rehabilitative Services:	
R87-29	Education for the handicapped	288,659
R87-30	Rehabilitation services and handicapped research	127,455
	Office of Vocational and Adult Education:	
R87-31	Vocational and adult education	432,319
	Office of Postsecondary Education:	
R87-32	Student financial assistance	1,269,000
R87-33	Higher education	203,050
	Office of Educational Research and Improvement:	
R87-34	Libraries	34,500
	Department of Energy:	
	Energy Programs:	
R87-35	Energy supply, research and development activities	81,800
R87-36	Fossil energy research and development	44,464
R87-37	Energy conservation	87,433
	Department of Health and Human Services:	
	Food and Drug Administration:	
R87-38	Buildings and facilities	500
	Health Resources and Services Administration:	
R87-39	Health resources and services	161,210
R87-40	Indian health facilities	57,100
	National Institutes of Health:	
R87-41	National Library of Medicine	5,405
	Office of the Assistant Secretary of Health:	
R87-42	Public health service management	5,000
	Departmental Management:	
R87-43	Policy research	2,200

Rescission Proposal No: R87-[illegible]

PROPOSED RESCISSION OF BUDGET AUTHORITY
Report Pursuant to Section 1012 of P.L. 93-344

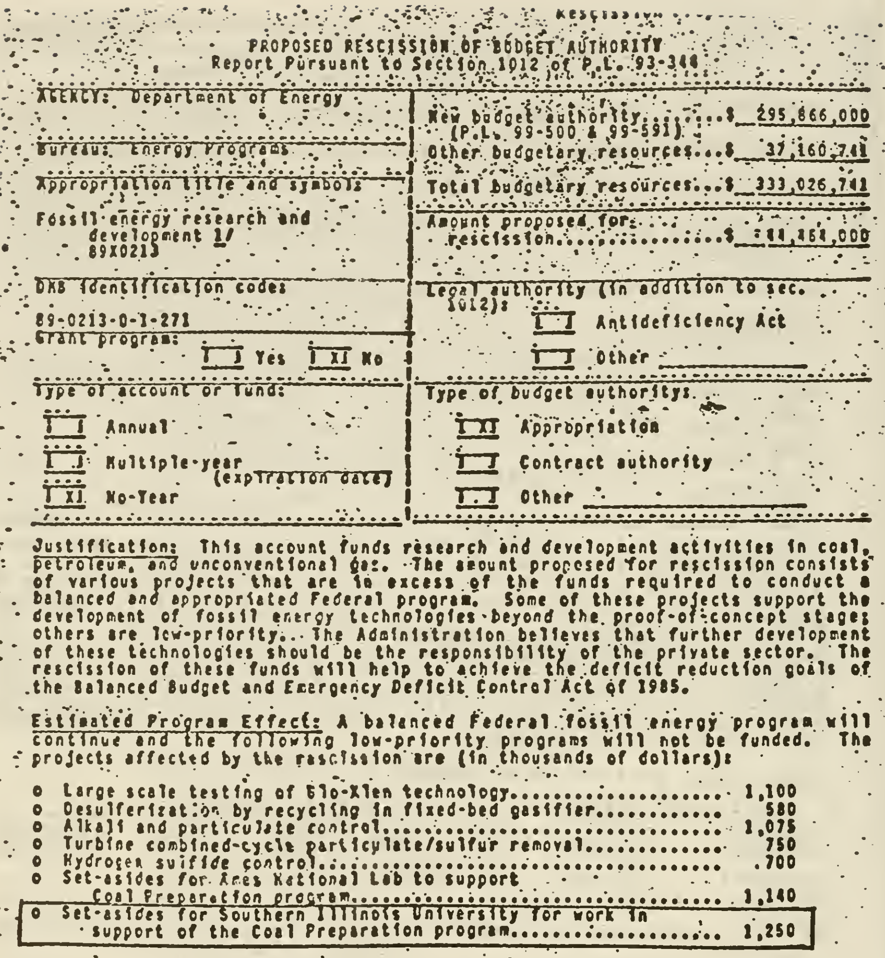
AGENCY: Department of Energy	New budget authority..........$ 1,347,048,000 (P.L. 99-500 & 99-591)
Bureau: Energy Programs	Other budgetary resources..$ 1,051,695,853
Appropriation title and symbol:	Total budgetary resources..$ 2,398,743,853
Energy supply, research and development 1/ 89X0224	Amount proposed for rescission....................$ 81,800,000
OMB identification code: 89-0224-0-1-271	Legal authority (in addition to sec. 1012): ☒ Antideficiency Act ☐ Other ______
Grant program: ☐ Yes ☒ No	
Type of account or fund: ☐ Annual ☐ Multiple-year (expiration date) ☒ No-Year	Type of budget authority: ☒ Appropriation ☐ Contract authority ☐ Other ______

Justification: The purpose of Energy supply, research and development activities is to: (1) support long-term research and development on a mix of technologies that have the potential to provide adequate supplies of energy at reasonable cost, and (2) fund other research programs which provide significant benefits to the Government and the public. The proposed rescission consists of Solar Energy research ($9.4 million) Electric Energy Systems research ($3.7 million) and university construction projects ($68.7 million) which includes the Center for New Industrial Materials, Energy Research Complex, Center for Science and Technology, Center for Science and Engineering, Center for Nuclear Imaging Research, St. Christopher's Hospital for Children; Center for Excellence in Education, and Center for Molecular Medicine and Immunology in the Institute of Nuclear Medicine.

Outlay Effect (in thousands of dollars):

1987 Outlay Estimate		Outlay Savings					
Without Rescission	With Rescission	1987	1988	1989	1990	1991	1992
2,002,873	1,975,013	27,860	53,940	...	...	...	...

1/ This account was the subject of a similar rescission proposal in 1986 (R86-8).



Rescission

PROPOSED RESCISSION OF BUDGET AUTHORITY
Report Pursuant to Section 1012 of P.L. 93-344

AGENCY: Department of Energy	New budget authority..........$ 295,866,000 (P.L. 99-500 & 99-591)
Bureau: Energy Programs	Other budgetary resources...$ 37,160,741
Appropriation title and symbols	Total budgetary resources...$ 333,026,741
Fossil energy research and development 1/ 89X0213	Amount proposed for rescission..............$ 11,161,000
OMB identification codes 89-0213-0-1-271	Legal authority (in addition to sec. 1012): ☐ Antideficiency Act ☐ Other ________
Grant program: ☐ Yes ☒ No	
Type of account or fund: ☐ Annual ☐ Multiple-year (expiration date) ☒ No-Year	Type of budget authority: ☒ Appropriation ☐ Contract authority ☐ Other ________

Justification: This account funds research and development activities in coal, petroleum, and unconventional gas. The amount proposed for rescission consists of various projects that are in excess of the funds required to conduct a balanced and appropriated Federal program. Some of these projects support the development of fossil energy technologies beyond the proof-of-concept stage; others are low-priority. The Administration believes that further development of these technologies should be the responsibility of the private sector. The rescission of these funds will help to achieve the deficit reduction goals of the Balanced Budget and Emergency Deficit Control Act of 1985.

Estimated Program Effect: A balanced Federal fossil energy program will continue and the following low-priority programs will not be funded. The projects affected by the rescission are (in thousands of dollars):

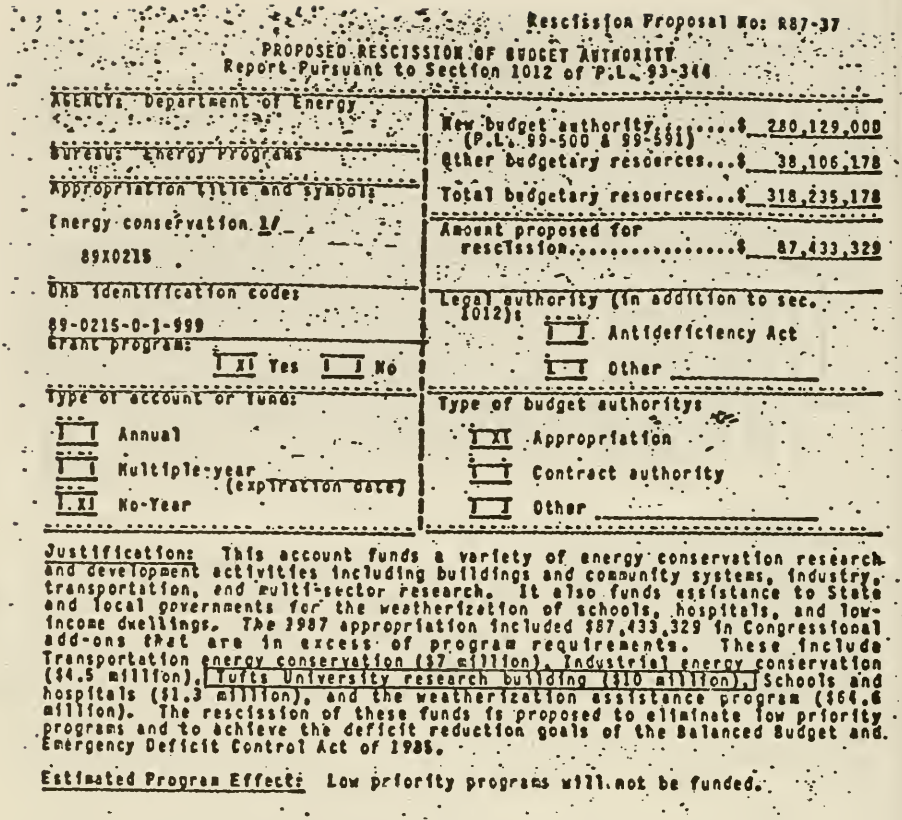
o Large scale testing of Glo-Klen technology..........................	1,100
o Desulferization by recycling in fixed-bed gasifier.............	580
o Alkali and particulate control..	1,075
o Turbine combined-cycle particulate/sulfur removal.............	750
o Hydrogen sulfide control..	700
o Set-asides for Ames National Lab to support Coal Preparation program...	1,140
o Set-asides for Southern Illinois University for work in support of the Coal Preparation program......................	1,250

o Continued low-priority operation of Wilsonville direct-liquification plant	4,150
o Continued low-priority operation of La Porte indirect-liquification plant	2,300
o Westinghouse Phosphoric Acid 7.5 KW fuel-cell	7,600
o Englehard 25 KW Phosphoric Acid fuel cell	1,500
o United Technologies/Toshiba (IFC) product refinement of 11 KW Phosphoric Acid fuel cell	2,000
o United Technologies/Toshiba (IFC) product development of 40 KW on-site Phosphoric Acid fuel cell	2,000
o Underground Coal Gasification field test at Hanna, WY, similar to one already successfully finished	1,000
o Continued unaffordable and lower-priority development of coal-fired Magnetohydrodynamics	10,319
o UNDERC (University of North Dakota Energy Research Center) set-aside for Control Technology and Coal Preparation	850
o UNDERC set-aside for Adv. Research & Technology Development	612
o UNDERC set-aside for Coal Liquification	1,019
o UNDERC set-aside for Combustion Systems	777
o UNDERC set-aside for Heat Engines	66
o UNDERC set-aside for Surface Coal Gasification	1,376
o WRI (Western Research Institute) set-aside for Underground Coal Gasification	548
o WRI set-aside for Advanced Process Technology	116
o WRI set-aside for Enhanced Oil Recovery	248
o WRI set-aside for Oil Shale	1,388
	44,464

Outlay Effect (in thousands of dollars):

1987 Outlay Estimate		Outlay Savings					
Without Rescission	With Rescission	1987	1988	1989	1990	1991	1992
348,196	334,857	13,339	22,232	...	...	...	...

1/ This account was the subject of a similar rescission proposal in 1986 (R86-80).



Rescission Proposal No: R87-37

PROPOSED RESCISSION OF BUDGET AUTHORITY
Report Pursuant to Section 1012 of P.L. 93-344

AGENCY: Department of Energy	New budget authority.........$ 280,129,000 (P.L. 99-500 & 99-591)
Bureau: Energy Programs	Other budgetary resources...$ 38,106,178
Appropriation title and symbol: Energy conservation 1/ 89X0215	Total budgetary resources...$ 318,235,178 Amount proposed for rescission................$ 87,433,329
OMB identification code: 89-0215-0-1-999	Legal authority (in addition to sec. 1012): ☐ Antideficiency Act ☐ Other
Grant program: ☒ Yes ☐ No	
Type of account or fund: ☐ Annual ☐ Multiple-year (expiration date) ☒ No-Year	Type of budget authority: ☒ Appropriation ☐ Contract authority ☐ Other

Justification: This account funds a variety of energy conservation research and development activities including buildings and community systems, industry, transportation, and multi-sector research. It also funds assistance to State and local governments for the weatherization of schools, hospitals, and low-income dwellings. The 1987 appropriation included $87,433,329 in Congressional add-ons that are in excess of program requirements. These include Transportation energy conservation ($7 million), Industrial energy conservation ($4.5 million), Tufts University research building ($10 million), Schools and hospitals ($1.3 million), and the weatherization assistance program ($64.6 million). The rescission of these funds is proposed to eliminate low priority programs and to achieve the deficit reduction goals of the Balanced Budget and Emergency Deficit Control Act of 1985.

Estimated Program Effect: Low priority programs will not be funded.

Outlay Effect (in thousands of dollars):

1987 Outlay Estimate		Outlay Savings					
Without Rescission	With Rescission	1987	1988	1989	1990	1991	1992
448,644	426,457	22,187	51,553	...	...	...	...

1/ This account was the subject of a similar rescission proposal in 1986 (R86-77A).

COMMITTEE: HOUSE SCIENCE, SPACE AND TECHNOLOGY
DATE: SEPTEMBER 21, 1994
WITNESS: MARTHA KREBS
PAGE 48, LINE 1056

INSERT FOR THE RECORD

In FY 1994, the Department of Energy (DOE) requested $2,000,000 for the Experimental Program to Stimulate Competitive Research (EPSCoR). However, in report language accompanying the FY 1994 Appropriation Act, the Congress specified that the DOE was to provide a total of $7,000,000 for this program. The Senate report included that "...from the funds available in the supporting research and technical analysis budget, the Department is directed to provide $7,000,000 to continue the (EPSCoR) initiative." The Conference report further offered: "The conferees recommend $7,000,000 for the DOE Experimental Program to Stimulate Competitive Research (DOE-EPSCoR) as recommended by the Senate." To comply with this congressional direction and specifically to use funds from within supporting research and technical analysis, the Department applied funds originally planned for the University Research Instrumentation (URI) program as the additional source of FY 1994 funding for EPSCoR. To demonstrate our commitment to the URI program, the Department did notify all potential URI grant recipients that, although no funds would be available in FY 1994, awards would be forthcoming in the first quarter of FY 1995. Since the normal process is for funds to be made available in the last quarter of the fiscal year this represented a delay of 1-2 months.

COMMITTEE: HOUSE SCIENCE, SPACE AND TECHNOLOGY
DATE: SEPTEMBER 21, 1994
WITNESS: MARTHA KREBS
PAGE 49, LINE 1080

INSERT FOR THE RECORD

In FY 1994, support for Congressional earmarks made without additional funds resulted in a reordering of Department and Administration priorities. Although no programs were cancelled entirely, several programs were affected and originally planned funding for certain grant and contract recipients were delayed or reduced. Reductions included funds planned for operation of user facilities, impacting user time available to university researchers, as well as basic research programs supporting laboratory and university science. Examples of research programs that were affected include global change, human genome, biological research, and environmental restoration and waste management.

Department of Energy
Washington, DC 20585

TELEFAX COVER SHEET

DATE 9/12/94

FROM

OFFICE OF CONGRESSIONAL AND INTERGOVERNMENTAL AFFAIRS
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C. 20585

MELANIE KENDERDINE - HOUSE LIAISON

TELEPHONE: 202-586-5468

TELEFAX: 202-586-4891

TO Dan Pearson

TELEFAX NO. 225-3895 CONFIRMATION NO.

This document contains ____ pages, (not including the cover sheet).

MESSAGE

Call me

Melanie

IF THERE IS A PROBLEM WITH THE CLARITY OR COMPLETENESS OF THIS DOCUMENT, PLEASE CONTACT OUR OFFICE AT THE ABOVE NUMBER. THANK YOU...

Special Congressional Interest Items
Academic Earmarks 1994

ENERGY AND WATER DEVELOPMENT	FY 1994 Approp. ($000)
Research by Southeast and Southwest Regional Photovoltaic Experiment Station	500
Research on disposal of Infectious hospital waste at a medical research center	1,000
Medical University of South Carolina Cancer/Oncology Center	5,800
Environmental & Biotechnology program, Florida A&M	4,000
Biomedical Information Communication Center – Oregon Health Sciences University	4,600
Urge support of medical centers of excellence for laser medical applications	381
Midwest Superconductivity Consortium	2,686
Supercoputer Computations Research Institute, Florida State University	6,800
Feasibility Study, Indian Reservations (univ. TBD)	700

Special Congressional Interest Items
Academic Earmarks 1994

ENERGY AND WATER DEVELOPMENT	FY 1994 Approp. ($000)
University research in robotics	3,500
University of Rochester – OMEGA laser upgrade	1,198
Seasonal Thermal Storage Program, University of Alabama	306
Geothermal Direct Heat Utilization Assistance Program, Oregon Institute of Technology	300
Conversion of Biomass to Electricity, Hawaii Natural Energy Institute	147
TOTAL ACADEMIC EARMARKS	**31,918**

Academic earmarks are sometimes directed in the legislative process without providing the commensurate funding. In these cases the Department must reduce program activities and realign related priorities to accommodate unfunded earmark requirements within existing funding levels. The Department addresses these unfunded academic earmark requirements together with general and program-specific reductions in an overall assessment to determine appropriate funding levels and sources. In this process, the Department strives to minimize the adverse impact to ongoing mission programs and activities.

Activity by activity, unfunded academic earmarks may curtail planned expansion or reduce, defer, or delay selected projects or ongoing projects; or slow project development and implementation.

DOE F 4650.2
(10-91)
(All Other Editions Are Obsolete)

Department of Energy
Office of Energy Research (OER)
Face Page

OMB Control No
1910-1400
(OMB Burden Disclosure
Statement on Back)

TITLE OF PROPOSED RESEARCH: Models of an Advanced Information Communication Research Network for Regional Health and Environmental Research

PLEASE TYPE THE FOLLOWING INFORMATION:

1. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER 81.049

2. CONGRESSIONAL DISTRICT
Applicant Organ's Dist 1
Project Site's Dist 1

3. I.R.S. ENTITY IDENTIFICATION OR SOCIAL SECURITY NUMBER
1936001786B8

4. AREA OF RESEARCH OR ANNOUNCEMENT TITLE/NUMBER
Health and Environmental Research

5. HAS THIS RESEARCH PROPOSAL BEEN SUBMITTED TO ANY OTHER FEDERAL AGENCY? ☐ yes ☒ no
PLEASE LIST

6. DOE/OER PROGRAM STAFF CONTACT (If known)

7. TYPE OF APPLICATION ☒ New ☐ Continuation
☐ Supplement ☐ Renewal ☐ Revision

8. ORGANIZATION TYPE Local Government ☐
State Government ☒ Non-Profit ☐ Hospital ☐
Indian Tribal Government ☐ Individual ☐ Other ☐
Institution of Higher Education ☒ For-Profit ☐
(Small Business ☐ Disadvantaged Business ☐ 8(a) ☐
Women-owned ☐)

9. CURRENT DOE AWARD NUMBER (IF APPLICABLE)

10. WILL THIS RESEARCH INVOLVE:
10A Human Subjects no ☒ If yes, ☐
Exemption No. (or)
IRB Approval Date
Assurance of Compliance No
10B Vertebrate Animals no ☒ If yes, ☐
IACUC Approval Date
Animal Welfare Assurance No

11. AMOUNT REQUESTED FROM DOE FOR ENTIRE PROJECT PERIOD $ 4,600,000

12. DURATION OF ENTIRE PROJECT PERIOD
9/1/94 (Mo/day/yr) to 2/29/96 (Mo/day/yr.)

13. REQUESTED AWARD START DATE
9/1/94 (Mo/day/yr.)

14. IS APPLICANT DELINQUENT ON ANY FEDERAL DEBT?
☐ Yes (If "Yes," attach an explanation) ☒ No

15. PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR NAME, TITLE, ADDRESS AND PHONE NUMBER
Lesley M. Hallick, PhD
Provost & Vice President for Academic Affairs
Oregon Health Sciences University
L349
3181 SW Sam Jackson Park Road
Portland, OR 97201-3098
503-494-4460

16. ORGANIZATION'S NAME, ADDRESS AND CERTIFYING REPRESENTATIVE'S NAME, TITLE AND PHONE NUMBER
Dennis Borden, PhD
Asst. Vice Pres., Research Administration
Oregon Health Sciences University
3181 SW Sam Jackson Park Road
Portland, OR 97201-3098
503-494-7784

OFFICIAL FILE COPY

Lesley M. Hallick
SIGNATURE OF PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR 6/18/94
Date

PI/PD ASSURANCE: I agree to accept responsibility for the scientific conduct of the project and to provide the required progress reports if an award is made as a result of this submission. Willful provision of false information is a criminal offense (U.S. Code, Title 18, Section 1001).

Dennis Borden
SIGNATURE OF ORGANIZATION'S CERTIFYING REPRESENTATIVE 6/18/94
Date

CERTIFICATION & ACCEPTANCE: I certify that the statements herein are true and complete to the best of my knowledge, and accept the obligation to comply with DOE terms and conditions if an award is made as the result of this submission. A willfully false certification is a criminal offense (U.S. Code, Title 18, Section 1001).

NOTICE FOR HANDLING PROPOSALS

This submission is to be used only for DOE evaluation purposes and this notice shall be affixed to any reproduction or abstract thereof. All Government and non-Government personnel handling this submission shall exercise extreme care to ensure that the information contained herein is not duplicated, used, or disclosed in whole or in part for any purpose other than evaluation without written permission except that if an award is made based on this submission, the terms of the award shall control disclosure and use. This notice does not limit the Government's right to use information contained in the submission if it is obtainable from another source without restriction. This is a Government notice, and shall not itself be construed to impose any liability upon the Government or Government personnel for any disclosure or use of data contained in this submission.

PRIVACY ACT STATEMENT

If applicable, you are requested, in accordance with 5 U.S.C., Sec. 552A, to voluntarily provide your Social Security Number (SSN). However, you will not be denied any right, benefit, or privilege provided by law because of a refusal to disclose your SSN. We request your SSN to aid in accurate identification, referral and review of applications for research/training support and for efficient management of Office of Energy Research grant/contract programs.

Models of an Advanced Information Communication Research Network for Regional Health and Environmental Research

Proposal from Oregon Health Sciences University

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DOE F 4620 1
(04-93)
All Other Editions Are Obsolete

U.S. Department of Energy
Budget Page
(See reverse for instructions)

OMB Control No
1910-1400
OMB Burden Disclosure
Statement on Reverse

ORGANIZATION Oregon Health Sciences University				Budget Page No 1	
PRINCIPAL INVESTIGATOR (PI)/PROJECT DIRECTOR (PD) Lesley M. Hallick, PhD				Requested Duration 18 (Months)	
A SENIOR PERSONNEL, PI/PD Co-PI's Faculty and Other Senior Associates (List each separately with title, A.7 show number in brackets)	DOE Funded Person - mos			Funds Requested	Funds Granted
	CAL	ACAD	SUMR	by Applicant	by DOE
1 Asst Prof Research Computing	18			$120,537	
2 Asst Prof Outcomes Computing	18			80,391	
3 Asst Prof Primary Care Info Needs	18			70,342	
4					
5					
6 ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7 ( ) TOTAL SENIOR PERSONNEL (1-6)				$271,320	
B OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1 ( ) POST DOCTORAL ASSOCIATES					
2 (5.6) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				$465,677	
3 ( ) GRADUATE STUDENTS					
4 ( ) UNDERGRADUATE STUDENTS					
5 ( ) SECRETARIAL - CLERICAL				$36,210	
6 ( ) OTHER					
TOTAL SALARIES AND WAGES (A + B)				$773,207	
C FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				$272,433	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				$1,045,640	
D PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM) See budget justification for itemization.					
TOTAL PERMANENT EQUIPMENT				$2,866,860	
E TRAVEL 1 DOMESTIC (INCL CANADA AND U S POSSESSIONS)				$138,000	
2. FOREIGN					
TOTAL TRAVEL				$138,000	
F TRAINEE/PARTICIPANT COSTS					
1 STIPENDS (itemize levels, types + totals on budget justification page)					
2 TUITION & FEES					
3 TRAINEE TRAVEL					
4 OTHER (fully explain on justification page)					
TOTAL PARTICIPANTS ( ) TOTAL COST					
G OTHER DIRECT COSTS					
1 MATERIALS AND SUPPLIES				$209,500	
2 PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3 CONSULTANT SERVICES				$340,000	
4 COMPUTER (ADP) SERVICES					
5 SUBCONTRACTS					
6 OTHER					
TOTAL OTHER DIRECT COSTS				$549,000	
H TOTAL DIRECT COSTS (A THROUGH G)				$4,600,000	
I INDIRECT COSTS (SPECIFY RATE AND BASE) Not requested					
TOTAL INDIRECT COSTS					
J TOTAL DIRECT AND INDIRECT COSTS (H + I)				$4,600,000	
K. AMOUNT OF ANY REQUIRED COST-SHARING FROM NON-FEDERAL SOURCES					
L TOTAL COST OF PROJECT (J + K)				$4,600,000	

Budget Justification

Personnel ($1,045,640 for 10.1 FTE):

A. Senior Personnel (2.5 FTE):

1. Principal Investigator Lesley M. Hallick, PhD will not require funding for her participation in this activity.

2. Co-Principal Investigators Kent Spackman, James Elert, James Morgan and James Williams, of the BICC program will not require funding from this proposal.

3. Senior Faculty (2.5 FTE)

Assistant Prof. Research Computing (1.0 FTE)	$120,587
Assistant Prof. Outcome Comuting (1.0 FTE)	80,391
Assistant Prof. Primary Care Info Needs (.50 FTE)	70,342
Total Senior Personnel	$271,320

B. Other Personnel (7.6 FTE)

Technicians/Programmers (6.6 FTE)	465,677
Secretarial-Clerical (1.0 FTE)	36,210
Total Other Personnel	$501,887
Total Salary and Wages	**$773,207**

Personnel is requested for the faculty researchers and their support staff in Health Informatics noted in Part Three: Research Programs, in the detailed description of the project. Refer to Section G. for contract employees.

C. Fringe Benefits:

Fringe benefit rates were calculated at 40% for 1.0 FTE (classified staff) and 35% for 9.1 FTE (academic staff). Calculations are based on the standard university fringe benefit rates.

Total Fringe	**$272,433**
Total Personnel Costs	**$1,045,640**

D. Permanent Equipment ($2,866,860):

Part One: Technology & Infrastructure Equipment ($1,960,000)

1) University-wide Network Equipment Conversion ($400,000)

A. Software:	$180,000
Campus wide Novell license	
DOS, Windows, and Mac OS licenses	
WP office 4.0 licenses	
Sabre menuing and network administration software	
Network Management software	
B. New Hardware	$96,000
8 new network file servers @ $12,000	
C. Upgrades to Existing PCs	$124,000
Memory upgrades	
Processor upgrades	
Total Equipment	$400,000

The network conversion will require the attachment of all campus local area networks (LANs) to a single fiberoptic backbone through high speed routers. All 80 file servers will need to be upgraded and to begin running the same network operating software. In addition, all 4,000 existing workstations on campus will require new core application software.

2) OHSU Infrastructure Re-routing ($250,000)

This upgrade will connect the BICC, which will house a second telephone switch and other communications equipment, to Bunker 1, the current communications hub for the campus. New copper and fiber cable will be laid to allow data, voice and video to be easily transmitted across the campus and out to our remote locations. The upgrade will provide increased throughput for additional devices and applications. Cost are based on experience with current AT&T installation costs on the campus for previous work.

Total re-routing	$250,000

3) Regional Healthcare Information Network ($300,000)

A. Communications	$150,000
Modems	

Leased lines
Satellite feeds, codex
Image capture systems, cameras and display units
Fees for use of commercial and state networks

B. Deployment and Training	$30,000
C. Software	$120,000
Total RHIN Equipment	$300,000

These funds will provide the basic infrastructure for equipping the clinicians who will be participating in the data collection and data sharing projects at OHSU.

4) Mainframe Software ($600,000)

A. Database Software: DB2	$450,000
B. Security Software	$150,000
Total Mainframe Expansion	$600,000

This software will provide the facilities to build the clinical data repository. In addition to the DB2 relational database software, utilities and tools for monitoring performance and utilization will be needed. A security package will insure patient confidentiality and prevent unauthorized access.

5) Research Computing Platform ($250,000)

A. Processor	$120,000
B. Disk	$ 40,000
C. Workstations	$ 62,000
D. Software	$ 28,000
Total Research Computing	$250,000

This computer facility will be used by the health informatics research faculty and staff to create databases for outcomes research and other informatics research activities, to perform statistical analysis, and to test search and retrieval tools. The processor will be a RISC minicomputer capable of running a version of the UNIX operating system, and the workstations will be appropriately configured Macintosh or PowerPC systems.

6) Telemedicine Research Facility ($100,000)

A. Communications equipment	$ 60,000
B. Workstations, Image capture/display	$ 20,000
C. Software	$ 20,000
Total Telemedicine Research Facility	$100,000

A number of telemedicine technologies will be evaluated to test their safety, utility and effectiveness. A wide range of equipment will be used, including computing and telecommunications hardware and software, and image capture and display systems.

7) Lifetime Clinical Record (LCR) ($60,000)

Interface software	$ 60,000
Total LCR	$60,000

This clinical data repository will house vast quantities of medical information. Patient data will be kept over the life of the patient to facilitate outcomes research and effective patient care monitoring. This product will be created in conjunction with SMS, the primary University Hospital software vendor.

Total Equipment for Part One: Technology & Infrastructure
$1,960,000

Part Two: Library & Education Equipment

1) Infrastructure: Research Library (200,000)

a. Research Workstations $125,000

The OHSU Library will upgrade and expand the number of high capacity, network-linked workstations for researchers. Training facilities will be expanded to permit larger numbers of local and remote clinical researchers and research assistants to become familiar with a wide array of software tools. A total of 40 Apple PowerPC's will be located in the research support area of the BICC.

b. Patient Resource Library $75,000

A special kiosk environment and workstation area is planned for the Patient Resource Library Prototype.

	Total $200,000

2) Infrastructure: Field Systems ($83,000)

a. Portable computers	$60,000
b. ATM Imaging Interface/PowerPC	$23,000
	Total $83,000

Light weight and wireless computer systems will be used to accurately and easily collect "field" data with the same ease once associated with patient populations studies in the formalized environment of the hospital or large clinic. The rapid advance of digital imaging and ultrasound technologies needs to be collected as part of that record. These extended data sets (images) will need higher speed networks and tools to capture, store, examine, and manipulate diagnostic record contents.

3) Diffusion and Training Facilities ($428,500)

a. E-Group Conferencing Software ($50,000)

The BICC has negotiated with the State of Oregon's Executive Division unit, Oregon ED-NET, to manage a groupware product for statewide electronic conferencing. The BICC will license the software, and Oregon ED-NET will provide systems operation in trade. This system will be available via BICC "800" number access, and through various statewide gateways via the Internet.

b. Microwave Link to Oregon ED-NET ($25,000)

Education and research planning and implementation have been conducted via Oregon ED-NET's regional satellite telecommunications system. It is the plan to add another access path to the satellite uplink from OHSU via a direct microwave link.

c. Transponder/ Digital Upgrade/MED-NET ($120,000)

OHSU needs to carry more programming on the Oregon ED-NET satellite transponder and thus has decided to expand the transponders effective bandwidth by digital compression, adding an additional full motion channel for medical applications without interfering with existing traffic. Decoders will be placed at receive sites in all parts of the state.

d. Rural Hospital Digital Signal Decoders ($67,000)

Thirty (30) or more Oregon hospital and clinical sites will be outfitted with decoders to be able to participate in privately transmitted compressed video signals. This private channel will become Oregon MED-NET.

e. University Hospital Clinical Conference Center Upgrade ($85,000)

An appropriate clinical conference room capable of transmitting teleconferences to Oregon researchers, and regional health care providers has become necessary. It is planned to remodel the current University Hospital clinical theater and to bring in network connections for both computer display and regional broadcasting or teleconferencing.

f. Image Processing/Computer/Storage ($50,000)

To organize computer captured digital images and for the purposes of manipulating and composing presentation and optical image databases, the BICC communications group will be adding a VideoCUBE editing system which captures a wide variety of digital images and permits their preparation and sequencing (still and motion clinical records) for use in teaching and research.

g. LCD AV Projector Display Units ($16,000)

A number of liquid crystal panels or 35mm projector inserts will be acquired due to the routine use of personal computers in the display of technical presentations of text and images. This will permit greater economies as presentations and research images will be able to be kept in their digital electronic state and reduce the need form costly film reproduction for projection in meeting rooms on and off campus.

h. Video Router/Switcher ($15,000)

Currently images are either routed over fiber in their analog or digital state to systems for capture or editing. Once in these environments display moves back to analog devices during the manipulation process in the multi-media editing suite. This facility now requires a state of the art video router/switcher to maintain image quality during manipulation.

Total	$428,500

4) Medical, Health, Site Facilities Software ($87,500)

a. CD-ROM Editor Software ($18,000)
Software to manipulate text, images and animated sequences for CD-ROM databases and teaching reports.

b. Radiologic Database ($15,000)
A software library of clinical images for teaching and illustration within the digital environment.

c. Pharmacologic Database ($15,000)
A software library of current clincal pharmacologic agents, diagrammed and sequenced for easy access in the development of teaching materials. Provided with text data base of clinical research, protocols, and contraindications.

d. Toxicology Database/CDPlus ($18,000)
License fees for expanded network use of the toxicology database.

e. Environmental Health & Safety Database ($18,000)
License fees for expanded network use of this national database.

f. Graphical Mapping License ($4,500)
License fees for use of a geographical mapping database tools for visualization of incidental information by geographic location. Use will be made of this system to plot and geographic visualized displays of health incidents within the State of Oregon and its legal geographic entities.

Total software	$87,500

Total equipment budget for Part Two: Library and Education Program Support	**$800,000**

Part Three: Research Programs

Microcomputer workstations and software	$106,860

Equipment in the research team common budget includes microcomputer workstations and related peripherals and software for the faculty and their research assistants.

Total Equipment for Part Three: Research Programs	$106,860
Total Equipment for the Project	$2,866,860

E. Travel: ($138,000)

Travel will support attendance at scientific meetings for the faculty and research associates, as well as travel to outlying areas in the state to collaborate with remote sites and conduct evaluations of information services and projects.

F. Trainee/Participant Costs: ($0)

There are no trainee costs in this proposal.

G. Other Direct Costs: ($549,000)

1. Materials and Supplies: ($209,000)

Funds are requested for office supplies, postage, computer supplies, photocopying and other related office and administrative expenses.

2. Publication Costs/Documentation/Dissemination: ($0)

There are no publication costs.

3. Consultant Services: ($340,000)

a. Technicians for Network Conversion (temporary)	$100,000
b. Analysts/programmers for development of lifetime clinical record	$120,000
c. Consultants for lifetime clinical record	$120,000
Total Consultant Services:	**$340,000**

Outside consultants and temporary technical help will be used in both the network conversion project and the lifetime clinical record project.

4. Computer Services: ($0)

There are no contracted computer services.

5. Subcontracts: ($0)

There are no subcontracts.

Total Other Direct Costs	$549,000
Total Funds Requested	**$4,600,000**

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCLA LEGISLATIVE
HEARING TRANSCRIPT UNIT
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November 3, 1994

OFFICE OF CONGRESSIONAL
AND LEGISLATIVE AFFAIRS

Gloria Dunderman
Staff Assistant
Committee on Science, Space,
and Technology
Washington, D.C. 20515

Dear Ms. Dunderman:

Enclosed is the corrected transcript from the October 6, 1994 hearing at which Jonathan Cannon, Assistant Administrator for Administration and Resources Management, U.S. Environmemtal Protection Agency, presented testimony on academic earmarks.

Also attached is the insert for page 38 of the hearing transcript.

We appreciate having been given the opportunity to review the enclosed transcript. If we can provide further assistance, please do not hesitate to contact our office.

Sincerely,

for Joan A. Platter

Robert W. Hickmott
Associate Administrator

Enclosure

Printed on Recycled Paper

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DCMN SUMIEL

ACADEMIC EARMARKS, PART III

Wednesday, September 21, 1994

House of Representatives,
Committee on Science, Space,
and Technology,
Washington, D.C.

The committee met, pursuant to call, at 10:45 a.m. in Room 2318, Rayburn House Office Building, Hon. George E. Brown, Jr. [chairman of the committee] presiding.

The CHAIRMAN. Let me introduce the first panel. We have with us this morning, and we are very pleased to have them, Dr. Marcie Greenwood, who is the Associate Director for Science at the Office of Science and Technology Policy in the White House; Dr. Martha Krebs, Director of the Office of Energy Research at DOE and well-known to this committee as a former senior staff member a few years ago; and we have from EPA Mr. Jon Cannon who is the Assistant Administrator, Office of Administration and Resource Management, and accompanied by Dr. Robert Huggett, who is the Assistant Administrator of the Office of R&D.

This panel, of course, is well aware of the problem. We invite them here to present their views of the earmarking situation and defend whatever practices their particular agency has for dealing with these matters.

And we are going to be friendly but critical of whatever you say. That is just a warning.

Marcie, do you wish to proceed?

STATEMENTS OF MARTHA KREBS, Ph.D., DIRECTOR OF ENERGY RESEARCH, U.S. DEPARTMENT OF ENERGY, WASHINGTON, D.C.; M.R.C. GREENWOOD, Ph.D., ASSOCIATE DIRECTOR FOR SCIENCE, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, WASHINGTON, D.C.; AND ~~JON~~ JONATHAN CANNON, ASSISTANT ADMINISTRATOR, OFFICE OF ADMINISTRATION AND RESOURCES MANAGEMENT, U.S. ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C., ACCOMPANIED BY ROBERT

The CHAIRMAN. We will now hear from Mr. Jon Cannon, Assistant Administrator, Office of Administration and Resource Management at EPA.

STATEMENT OF JON CANNON .

Mr. CANNON. Good morning, Mr. Chairman, and members of the Committee. Thank you very much for the opportunity to be here today.

I am accompanied today by Dr. Robert Huggett, who is our newly confirmed Assistant Administrator for Research and Development, and I am hopeful this morning that Dr. Huggett will have an opportunity to discuss with the Committee plans that he has with the Office of Research and Development to further the cause of science at EPA and to improve peer review and other elements of our scientific program as alluded to earlier by the Chairman.

EPA recognizes the prerogatives of Congress to establish our budget and to set priorities through that process. However, we do work hard during the formation of the budget request, that ultimately is the President's request, to identify the most pressing environmental priorities that we have and to fulfill our mission as best we can within the limited resources that we are given.

~~Recently,~~ We are committing to a research agenda that will sharpen, we hope, our ability to focus research dollars where the priorities are most urgent and to address our research program to the areas where environmental risk is most uncertain and where we think we can get the most for our dollars.

In that regard we certainly ~~do not solicit~~ do not support academic earmarks, because they frustrate our ability to ~~do~~ focus on ~~that~~ the most urgent priorities. We would much rather rely on our normal budget processes and peer review processes to establish our work priorities.

Nevertheless, we do receive earmarks, as the Chairman has mentioned. We identify them from several different sources, including bill language, the reports of the Senate, the House and the Appropriations conference.

After we review this language we compile a list of the items much as Dr. Krebs has described in the Department of Energy. Those items are sent out to the program offices and steps are taken to fund those items as appropriate.

We do work hard in that context to ensure, particularly where an academic institution is directed, that to the greatest extent possible the research meets the requirements of our mission. The projects that result from academic earmarks are still required to submit a written proposal. That proposal is reviewed and deficiencies are sought to be corrected. We intend with our new science program that Dr.

Huggett is working on to ensure that all academic earmarks are subject to peer review as are our traditional ORD grants.

We attempt to ensure that the products paid for by earmarked dollars provide information that compliments the Agency's mission and research plans and represent good science.

The impacts of academic earmarks are considerable. In fiscal year '94 we had, as the Chairman has noted, a downturn in academic earmarks, but generally ~~-- and this is a statement about our overall earmark situation. Generally,~~ we have been experiencing increases in earmarks over the last 4 or 5 years, and this has happened during a time when we are facing, as all of you know, increased limitations on our resources.

When Congress does not appropriate funds that go with the earmarks, we must cut other programs, including our competitive grants programs for which we have requested funding through the budget process.

Because the earmarks are not subject to competitive peer review, as has been previously discussed, they do undercut our goal of good science and engineering. And, as Dr. Huggett may have the opportunity to discuss, we have an ambitious program to improve that effort within the agency for which we have high hopes.

The CHAIRMAN. Do you have a statement, Dr. Huggett, that you would like to present at this time?

Mr. HUGGETT. No, sir, I do not.

The CHAIRMAN. Let me make a few brief observations. To the representatives of Department of Energy and EPA, each of you, you have both indicated that you don't like earmarks, that you think they are deleterious, and yet you are going to continue to go on earmarking because you feel that that is either the will of the Congress or for some other reason.

Would you be able to explain to me why you would proceed to carry out an earmark contained in report language when you have acknowledged that it does not have the effect of law, each of you?

Mr. CANNON. ~~Why don't I--since my light is on, Mr. Chairman, why don't I venture forward?~~ I am extremely sensitive to your remarks about ~~the hanging~~ earmarks previously cited, but let me venture a response here.

We attempt in our interpretation of the appropriations bills and the report language to discern to the best of our ability the intent of Congress. And I acknowledge the chairman's remark that on a strict legal reading we are not compelled by report language to honor the contents of the report language, but we do believe that that is ~~an indication~~ a further indication of intent and therefore we do follow a policy of implementing that language.

The CHAIRMAN. That is not a good enough answer. If I were to call you up and indicate it was my intent to spend a certain amount of money in California for a lab I happen to like, would you do that?

Mr. CANNON. We would take that under consideration. But I have to admit to the Chairman that that would not have the same force as report language in the appropriations bill.

The CHAIRMAN. Do you ever have phone calls from staff members of the Appropriations Committee indicating what they think is the intent of Congress and asking you to carry it out?

Mr. CANNON. We do have discussions with staff when report language and the appropriations language is unclear with staff in an attempt to determine what the intent of that language is.

The CHAIRMAN. And then you carry it out?

Mr. CANNON. To the best of our ability to understand it--

The CHAIRMAN. Even though it requires you to take money away from programs that have been enacted into law, have the support of the President, and have been passed by the entire Congress?

Mr. CANNON. That is true. The extent that we believe it is the intent of the committee.

The CHAIRMAN. All right.

Dr. Krebs?

Ms. KREBS. In large measure, our process is very similar in the sense that when we receive--we try in our conversations with the Congress, whether it is expressed in law or through report language, to identify to the best of our ability what is intended. And in terms of working with the Congress, we acknowledge their guidance, and it--we inform them as to the impact on priorities which they may have some interest in, but then we generally take their advice.

The CHAIRMAN. Do either of you--neither of you have mentioned because it is a little indelicate, but do you feel that your actions are motivated by a sense that you might be exposed to retaliatory action by the Appropriations Committee? And please be honest with me about this.

Ms. KREBS. Well, I have to acknowledge that, you know, I have been in this position for a year and so I personally do not have a sense that I would experience retaliatory action. The experience of the Department over a period of time is not so clear to me. That is where I am--you know, my perspective on it.

The CHAIRMAN. All right.

~~Mr. Cannon--~~

~~Mr. CANNON. Mr. Chairman, I--~~

The CHAIRMAN. --deep down in your soul do you ever fear retaliation from the Appropriations Committee if you neglect to carry out the wishes expressed even in a casual clarifying phone call from a staff member?

Mr. CANNON. Mr. Chairman, probably deep down in my soul I fear retaliation from many sources. But ~~I believe--I~~ have no personal knowledge of retaliation. ~~But~~ I think it is clear that the Agency and all the agencies believe it is in their interest to follow these directives.

The CHAIRMAN. Well, I think that is obvious.

All right. Let me ask you one additional question. Dr. Krebs, does your agency have the authority to fund research facilities, laboratories, et cetera, on universities--at universities giving title to these facilities to universities? Do you have that authority contained in law at any point?

Ms. KREBS. That is a hard question for me to answer in the sense that whether or not we have that contained in law. If you mean do we have that in authorizing language--

The CHAIRMAN. Correct.

Ms. KREBS. I am not aware whether we do or not. What I am aware of is that we do vest title to these entities--

The CHAIRMAN. I am well aware of that too. I want you to tell me, and if you need to get your staff to research it--

Ms. KREBS. I'll have to do that.

The CHAIRMAN. --what the basis in law is.

Ms. KREBS. I will do that.

[The information follows:]

The CHAIRMAN. Same question to you.

Mr. CANNON. Mr. Chairman, I think if I understand the question we are asking ~~let me repeat it and make sure I do understand~~ ~~it is~~ whether we would have under an authorized direction as to the scope or limits of our program the ability to change that unilaterally.

The CHAIRMAN. No. No. I want to know if you have by authority of law the authority to build laboratories, research facilities on university campuses or anyplace else and turn them over to the university.

I presume you have authority, as long as you get the money, to build laboratories for EPA. But I am asking you if you have the authority to build laboratories or other facilities on university campuses which become the property of the university.

Mr. CANNON. I think as a general matter no, but I would have to qualify that. There may be particular authorizations. (See insert attached to page 38)

The CHAIRMAN. Would you find out and answer for me?

And I'll tell you why I am asking. This committee has sweated blood trying to get funding for authorized programs to build facilities in NSF, for example. We've never gotten them. Instead you two agencies fund the same facilities without authority in earmarks, and that doesn't make me very happy.

Question for Jonathan Cannon
From Chairman Brown
October 6, 1994

[Page 36, lines, 792-798]

Question: Does your Agency have the authority to fund research facilities, laboratories, et cetera, on universities -- at universities, giving title to these facilities to universities? Do you have that authority contained in law at any point?

Answer: EPA has no general authority to provide funding for these types of facilities and then to give title to them away. On one occasion however, Congress in our 1993 appropriations bill, directed the Agency to give title to a library to Oregon State University.

The CHAIRMAN. Thank you very much, Mr. Boehlert.

Mr. Barca, do you have any questions?

Mr. BARCA. Perhaps I would just ask for a clarification from Mr. Cannon from an earlier statement. When you said that at times you get calls to clarify what the report language is, I guess, how common are those kinds of calls to clarify what report language is?

Mr. CANNON. I don't know whether I can give you ~~sort of a~~ quantitative estimate, but we do find ~~not in~~frequently that the language in the report or in the appropriations bill is not clear as to what exactly is intended, and the colloquy is designed to elicit that.

In ~~some cases it is determined that the colloquies on the floor were mentioned previously.~~ Sometimes the colloquies on the floor help elucidate the bill language or the report language and are useful in that regard. But where that is not the case further conversations with staff may be necessary.

Mr. BARCA. Have you gotten calls where there was no clarification requested at all, just strictly requesting that money be granted where there is no report language, where there is no colloquy, where there is no language anyplace, anywhere within the context of the debate or the report or the bill itself?

Mr. CANNON. I am not aware of those instances.

NOV 28

NORTHWESTERN UNIVERSITY
REBECCA CROWN CENTER
EVANSTON, ILLINOIS 60208-1117

VICE PRESIDENT
FOR
INSTITUTIONAL RELATIONS

AREA CODE 708
TELEPHONE: 491-7490

November 22, 1994

The Honorable George E. Brown, Jr., Chairman
House Committee on Science, Space, and
Technology
2320 Rayburn House Office Building
Washington, D. C. 20515-6301

Dear Mr. Chairman:

I have enclosed my response to your written questions that were composed as a follow-up to my testimony at the September 21 hearing. I am enclosing a corrected copy of the pages from the hearing transcript that contained my oral testimony.

I hope this information will be satisfactory.

Sincerely,

William Ihlanfeldt

WI:gr

Enc.

NOV 23

have you listed, which is Dr. William Ihlandfeldt first.

STATEMENTS OF WILLIAM IHLANDFELDT, Ph.D., VICE PRESIDENT FOR INSTITUTIONAL RELATIONS AND CHAIRMAN OF RESEARCH PARK, INC., NORTHWESTERN UNIVERSITY, EVANSTON, ILLINOIS; JOSEPH D. BLOOM, Ph.D., DEAN, SCHOOL OF MEDICINE, OREGON HEALTH SCIENCES UNIVERSITY, PORTLAND, OREGON; CAROL ASCHENBRENER, Ph.D., CHANCELLOR, UNIVERSITY OF NEBRASKA MEDICAL CENTER, LINCOLN, NEBRASKA

STATEMENT OF WILLIAM IHLAN~~D~~FELDT, Ph.D.

IHLANFELDT

~~Mr~~. IHLAN~~D~~FELDT. Mr. Chairman, my name is Bill Ihlan~~d~~feldt. I am Northwestern University's Vice President for Institutional Relations, which is the office responsible for government and community relations, and chairman of the board of directors for Research Park, Inc., which is in charge of the overall development and management for the Northwestern University-Evanston Research Park, a joint venture with the city of Evanston.

Mr. Chairman, I am pleased to have the opportunity to testify before the distinguished committee about the Basic Industry Research Laboratory, referred to as BIRL, and the Biotechnology Center facilities and relationships to an innovative, 2-part economic development project, establishment of the Research Park as a joint venture with the city, and construction or modernization of related research facilities on campus.

Northwestern is a major research university. In FY 1994 Northwestern received a total of $168 million in external awards for sponsored programs, and had a total operating budget of $678 million in expenditures.

During the recession of the early 1980's Northwestern was encouraged by Illinois political and community leaders to employ its research resources in order to revitalize traditional manufacturing and stimulate economic development. However, many of the university research facilities were outmoded for the conduct of modern science and already utilized beyond capacity.

Because no Federal programs were available to address this need for academic facilities, Northwestern petitioned Congress to fund construction not only of the BIRL and Biotechnology Center facilities, but also the material science facility on the campus.

To date, Northwestern has received from Congress $43.5 million in appropriations for the three facilities: $25.5 million for BIRL; $16 million for the material science facility on the campus; and $2 million for the Biotechnology Center facilities.

However, these Federal dollars have already leveraged 184 million in non-Federal dollars. If Northwestern's full $12 million request for the Biotechnology Center facilities is subsequently appropriated by Congress, and if both the Research Park and its related research facilities on campus are ~~billed~~ built out at least to the original estimate of $500 million in capital expenditures, the Federal appropriation for $53.5 million will comprise only 10.7 percent of this total investment.

This economic development project has already produced clear benefits. Attracted by Northwestern's state-of-the-art facilities, expert faculty and well-trained students in such areas as manufacturing, biotechnology and computers, companies have located in the Research Park or increased support for sponsored programs.

The Research Park now has 60 tenant companies representing 850 jobs. University-industry interaction has increased significantly, and industry support for research has risen from 3 percent to 15 percent of all external support.

The project would have been difficult or impossible to start without Federal seed money. It is a matter of fact that people will not invest in sewer pipes, asbestos removal and ~~many of the infrastructure,~~ much of the infrastructure that comprises the science facilities on the campus.

The only source of Federal funds was through direct congressional appropriations. Northwestern and representatives from the city of Evanston approached

Illinois Senators and Congressmen. who then agreed to help, -- prepared proposals and testimonies documenting the needs, cost and benefits of the project, and cooperated with the funding agencies.

We believe these procedures provided adequate information for Congress to exercise its authority in funding projects of this sort. Moreover, we believe the benefits today confirm the judgment of Congress in funding Northwestern's request.

What I would like to do now, Mr. Chairman, is try to answer some of the specific questions you have in a very summarily way.

The objectives of the project were really fivefold. One was to expand the job and tax base of the region and the home community. Two was to reverse the science and engineering brain drain from the Midwest. We've produced the most scientists and engineers. and they had been gravitating toward the two Coasts, primarily because of the defense installations located in those areas. Three was to facilitate technology transfers through greater collaboration with industry. Four was to assist in reversing the net outflow of Federal tax dollars from Illinois. Illinois at that time was receiving 60 cents on the dollar, California, I believe, ~~at the time was~~ $1.20 or $1.30, and Massachusetts ~~was~~ $1.20. So we were last in the Nation. And five was to ~~we~~ address the decaying science infrastructure, particularly at Northwestern.

This concept was encouraged by the Civic Committee of Chicago. Also the Governor of Illinois~~'s office~~ and the Mayor of Chicago~~, and~~ encouraged the University of Illinois, University of Chicago and Northwestern to become much more active in the transfer of technology and collaboration with industry.

To date, in terms of results, there are 60 companies in the Park, which is 24 acres, 300,000 square feet has been built out, and there are 850 employees. The tax base for that area has increased by 600 percent. Two million dollars in seed venture capital from local companies and the banks in the area as well as the university has leveraged an additional $45 million in private investment in those same companies, essentially the 60 companies in the park.

BIRL opened its doors in 1988 with zero contract research, and this year we will do approximately $7 million at a time when contract research nationwide has been decreasing, as you well know.

In addition to having an independent employment force, there are 30 faculty and roughly 37 graduate students involved in the contract research funding of BIRL. That is a little bit about the Park.

In terms of the university's sponsored research, from '84 to '93, it grew from $61 million to $155 million, and the industrial component from $1.9 million or 3.2 percent to $23.4 million or

15 percent.

Biotech area funding increased by 50 percent from $10 million to $15 million, and those facilities are not yet complete. The biotech master's program was established. Interestingly enough, we found that there is not, at least in the Midwest, a biotech master's program focusing on the business of biotechnology, and through an interdisciplinary program in engineering, business, and medicine, we now have that program. Demand for the program far exceeds supply, and we are educating about 25 to 30 students per year. They have internships, and job opportunities far exceed the supply of students.

Regarding corporate outreach and collaboration, ~~roughly~~ now over 200 companies have some relationship with the university in terms of training, contract and sponsored research and student internships.

The last question you raised is the question related to proliferation of direct appropriations. Service, ~~in terms~~ as one of the three major roles of the university, has taken on a new connotation, and that is clearly economic development. When I was growing up in Southern Illinois, there was a major initiative to create a new university called Southern Illinois University, and the reason for that was basically because the coal mines were being shut down and universities or State satellite universities were being established not only in Illinois but throughout the country as an economic development tool.

The current modus operandi for a lot of States is to create prisons, again for the purpose of economic stability within various communities, and municipalities, of course, continue to seek congressionally mandated funds. We think that the issue of economic development will remain paramount, even in front of private universities, particularly those that have excellent faculties.

The other issue, of course, remains in the area of deferred maintenance~~, and~~. The amount that has been allocated so far by Congress, with a max of $7 million for any one program, simply is insufficient to meet the decaying infrastructure in higher education and in the science establishment.

In terms of suggestions, I simply think that the experience we have had with USDA has been a very positive one in terms of peer review, reevaluation of congressional recommendations, and then a report back to Congress and a monitoring procedure. It is not unlike some of the statements that were made ~~with~~ by the prior panel as to what they intend to do, but USDA has had this process in existence for sometime.

Thank you, Mr. Chairman. That is the end of my comments.

The CHAIRMAN. Thank you very much, Dr. Ihlandfeldt.

The CHAIRMAN. We will move into some questions. But before we do that I would like to recognize our ranking Republican member, Mr. Walker, for whatever opening statement he may wish to make, and he may start the questioning if he likes.

Mr. WALKER. Thank you, Mr. Chairman. I did have an opening statement here that I would ask unanimous consent be made a part of the record.

The CHAIRMAN. Without objection, so ordered.

Mr. WALKER. One can't help but be impressed by the nature of the projects that you describe, and there is no doubt that good work is being done with the money that you have received from everything that you have told us here today.

But in the case of the projects that you told us about and talked to us about, did you seek money through the peer review process before going the earmark route? Yes, sir?

Mr. IHLANDFELDT. My response to that is that there was no process to achieve that objective. Facility funding simply was not available in the mid-'80's. It had been available in the '60s and early '70s, but money was no longer appropriated for that purpose.

Mr. BLOOM. I would have the same response. I mean the main part of our project is capital cost and infrastructure development, and we did not know of available other funding.

Ms. ASCHENBRENER. Likewise, there was no appropriate peer review mechanism.

Mr. WALKER. Well, I thank you for that response, but then that follows up the question with a question of is it not possible that there are institutions that have just as worthy goals and programs that would also like to find capital monies from the Federal Government?

I mean I think we can assume that you are not the only institutions in the country that have those needs. Is that a rational assumption?

Mr. IHLAN~~D~~FELDT. Well, I think that you'll note in my testimony that I think we have been able to identify through various surveys--NSF, ACE, et cetera--that the needs are in the billions of dollars, and they range from a low of $25 billion to a high of $100 billion. So, we're talking about a serious problem facing this country in order to maintain our science and engineering infrastructure.

Mr. WALKER. Well, I would agree with that, and my point is, though, that if there is no peer review process utilized, then the question becomes what's the sorting out process for those who have a variety of needs?

I mean you've identified the needs that you have. You've identified excellent programs that you are running utilizing the facilities that were purchased, but the fact is that the sorting out process is reasonably esoteric if you are--if what you are using is political clout as the way of arriving at the decision.

I mean how was the money prioritized in the case of the programs that you are raising with us today?

Mr. BLOOM. How was it prioritized by?

Mr. WALKER. Whoever gave you the money. Where did we decide that what you wanted to get was by far the singlemost important item of the $25 billion of need that exists in the country?

Mr. IHLAN~~D~~FELDT. Well, I'll try my hand at that.

Mr. WALKER. Okay.

Mr. IHLAN~~D~~FELDT. I suspect that we're not talking about three institutions, we're talking maybe 40, 50, 100.

Mr. WALKER. Right. My problem is this, and just to preface it, whether we went back and looked--I mean the story has always been made that the reason why you come to do this is because it separates the haves and the have-nots and the have-nots are able to pick up some money this way.

When you go through and look at what happened, the Congressional Research Service has done it and found out that the top ten State recipients of peer reviewed research dollars are also the top five beneficiaries of academic earmarks.

So, the sorting out process is not being done on behalf of haves and have-nots, you know. It is being done in a way that leads to somewhat similar results. And for the life of me, I don't understand how it is being appropriately prioritized.

Mr. IHLANDFELDT. I think that is a committee process, in essence. And it seems to me that the idea of intrinsic peer review with no inclusion of an extrinsic kind of evaluation is not the wave of the future, and that what we have to do is develop some kind of a new system which includes both in that process.

If not, I suspect that Congress among itself will continue to debate this issue, and educators as well.

Mr. WALKER. Well, for example, did any of you use a lobbying firm in order to come to Capitol Hill with your request?

Mr. IHLANDFELDT. We did. And rather than having an office in D.C. like many of our peer institutions, we elected to out-source most of our consulting and lobbying to a firm in D.C.

Mr. BLOOM. We have no firm in D.C.

Mr. WALKER. And do you have an office here?

Mr. BLOOM. No.

Mr. WALKER. Okay.

Ms. ASCHENBRENER. We did not use a lobbyist, and we do not have an office here.

Mr. WALKER. Okay. In the case of where you did not use a lobbying firm, were there particular Members of Congress it's under construction.

What happens if the Federal Government does not come up with the rest of the money? That is, what happens if the Appropriations Committee is unable to find that additional funding?

Mr. IHLAN~~D~~FELDT. Well, just to clarify, we have debt financed a good part of that at this point in time, and it simply means that we will have to raise more than the match that we had agreed to. The total cost is around $24.4 million, and we had agreed to come up with $12.4 million of that.

So, our request or our responsibility or liability would simply increase, and it would take us that much longer to complete it.

Mr. MINGE. Would you build that facility without the Federal match?

Mr. IHLAN~~D~~FELDT. We already have in the context of debt financing it.

Mr. MINGE. Would you have built it without an anticipated Federal contribution to the extent of the $12 million?

Mr. IHLAN~~D~~FELDT. Probably not.

Mr. MINGE. I'd like to follow up with a question that was asked. If we here in Congress are trying to both deal with the deficit and responsibly deal with the allocation of scarce dollars among universities, all of whom are clamoring for funding, what would you recommend that we do in order to avoid the use of essentially the political process and the longevity of Members of Congress to determine which institutions obtain funding?

And you are in a somewhat vulnerable position, because if the chair of the Ag Subcommittee of Appropriations moves over to another subcommittee you would no longer have a member of the Illinois delegation that has that ability to help you out with money that is needed for your facility.

Do you have any suggestion as to what we ought to do?

Mr. IHLANFELDT. Well, first of all, I think we have to recognize and somehow fund a much larger appropriation for facilities, particularly science facilities, nationwide. I think secondly there has got to be extrinsic as well as intrinsic review of the needs of a particular proposal as it relates to the society or the region in which it is located.

That is not unlike what USDA does today. Now, they do make recommendations back to Congress in terms of their peer review process. Now, whether Congress listens or not is another question. But they do prioritize projects as well based upon that peer review process.

So, they do bring to the system a new way of doing it--actually, it is an old way because they have been around and have been doing it for sometime. It is just that agriculture has been looked at in a sort of asymmetrical way in contrast to the rest of science.

And we've got to do what we're doing here, shed a little public light on this process in order that we can all work to achieve a better system.

Forgive me for that interruption.

Mr. MINGE. No. Well, that is--and that is essentially what I'm trying to reach for. In large part, this is an internal struggle within the Congress, as you well know. And if we are able to come up with an appropriation for the aggregate for university research facilities that is reasonable given the needs that you have been talking about in both your prepared testimony and now in the question and answer period, I sense that you feel that we could use that peer review process and maintain some integrity in the system.

Mr. IHLAN~~D~~FELDT. Well, I do. I can't speak for my colleagues.

Mr. MINGE. Well, what about the rest of you?

Ms. ASCHENBRENER. I will comment on that. I think more funding for research facilities is a much needed and very important step forward.

I would have to say I think that probably that in itself would not be totally sufficient. I think earlier Dr. Ihlan~~d~~feldt made some mention that perhaps we need more than one kind of mechanism. I believe very much in peer review, but we sometimes talk about the peer review process as

And let's assume that each one of them tries to become as conversant with the system as Northwestern and decides to hire a consulting firm and go after this money.

Are we, in effect, in this country at that point spending too much in terms of our resources at academic institutions even trying to chase scarce resources, and maybe we'd be better off if the Federal Government just shut down funding entirely rather than having you spend several thousand dollars and on a nationwide basis perhaps millions of dollars chasing millions of dollars.

That is kind of a statement, but also I'd like to just have your response to it, and not trying to put you on the spot so much as looking at this from the outside on the broader scale, what would your comment be?

Mr. IHLAN~~D~~FELDT. Well, certainly it is a conundrum. You're on the horns of a dilemma. But I should add that one of the things that we can't overlook is that universities are very much an extension of their municipalities today, and the pressures to stabilize their economies and to become much more active in transferring technology and assisting the formation of new companies is quite a different role than what we have had historically over the last 40 years. And those pressures are not going to go away simply because we would set up a system that you just defined.

If we look at how municipalities receive funds, they very much receive it the same way educational institutions have in terms of the ones that are before you, and I'm not sure that is going to change in the near future. And the pressures that municipalities place on educational institutions or the States place on educational institutions is not going to go away in terms of the future, ~~B~~because the future is in becoming much more competitive, being able to participate in the global economy. ~~a~~And each State is there to get its fair share, and that fair share may be a disproportionate share depending on where one sits or stands.

Mr. Minge. So, we're just saying this is an inevitable by-product of the process, if you will, in Congress and in our country? stet

Mr. IHLAN~~D~~FELDT. Well, I think the process could be improved upon, and I have made a suggestion along those lines. However, as long as there are some people on the outside looking in, they are going to try to use the--or petition Congress as they have historically.

Mr. MINGE. What would you estimate it costs Northwestern a year to maintain the sort of lobbying or consulting firm that you need in order to keep abreast of the opportunities that exist in seeking funding in Congress?

Mr. IHLAN~~D~~FELDT. We would estimate probably between $300,000 and $400,000 a year.

Mr. MINGE. Would you, based on your experience at

Northwestern, think that similar expenses are being incurred by, let's say, at least 50 other major universities around the country?

Mr. IHLANDFELDT. I would say more than 50.

Mr. MINGE. How many would you estimate?

Mr. IHLANDFELDT. Probably a couple hundred.

Mr. MINGE. So, if it is a couple hundred times $300,000--I'm not sure my math is going to get there quickly enough--we're talking about $60 million?

Mr. IHLANDFELDT. Well, I--that is your number, Congressman.

Mr. MINGE. Yes. Well, I'm just trying to extrapolate from--

Mr. IHLANDFELDT. I just think that there are a lot of institutions that, either at the State level or at the Federal level, are extremely active petitioning either the legislature or Congress. And the closer home one gets the smaller the institutions participating in the petitioning process.

Mr. MINGE. Well, I thank you for engaging in this discussion, and hopefully it will shed some light on how we should operate here in Congress.

The CHAIRMAN. Thank you, Mr. Minge.

Mr. Fawell?

Mr. FAWELL. Thank you, Mr. Chairman. One learns

Mr. IHLANDFELDT. Well, there have been surveys made by various Federal agencies as well as ACE.

Mr. FAWELL. What we have, obviously, is there is no real private sector, I gather, such as the Academy of Sciences and others that are, or a banning together by higher educational institutions to try to recommend to Congress, not that Congress through it is administrative branch should not be doing the same thing, as to what our national needs are and how we best can collectively set about to get the job done.

We are, obviously, on an ad hoc basis, every person for himself or herself, and whoever may indeed have a fortunate situation of one who has high seniority, and also I would say the correct party, on an Appropriation Committee will be the one that has the chance of striking it rich and being able to get for your institution what you feel you'll need. As I say that, I can understand that circumstance existing.

But it is a devilish situation we face. As co-chairman of the bipartisan pork busters group, we evolved because of the situation. We never envisioned the idea that we would try to identify pork. We did envision that what we would try to do every year, because the appropriation bills go flying by so fast, hundreds and hundreds of pages evolving all kind of complex descriptions that nobody has the time to look at, that we thought that, Well, we can wait.

Northwestern University Responses
To Questions for the Hearing Record

I. General Background on University Finances and Construction

1. From May 1, 1983 until the present, Northwestern has had a contract with Cassidy and Associates (originally Schlossberg, Cassidy and Associates) to perform a variety of consulting services. For example, the firm monitors and reports on legislative and regulatory issues of concern to Northwestern, provides feedback regarding Northwestern's assessment of problems and proposal of innovative solutions, and assists with the formulation and implementation of strategic plans by identifying new areas of interest and activity in Congress that match Northwestern's needs and strengths, and by suggesting ways to interact with state and local government and to collaborate with industry.

2. Table 1 provides a list of payments for service to Cassidy and Associates since 1984 by fiscal year (the FY1983 payment was approximately $60,000), with a grand total for the 11-year period. Because of the broad nature of the consulting services provided by the firm, Northwestern made no attempt to keep a separate record of charges that might be attributed to the BIRL and Biotechnology Center projects. In fact, any

implication that Northwestern paid fees to the firm solely for assistance in obtaining congressionally mandated facility grants for these projects would be erroneous and misleading.

3. Table 2 presents a list of the annual totals for all research grants received by Northwestern during the past 10 fiscal years, with a breakdown by sources of funding and a grand total for the 10-year period.

4. Table 3 gives a list by fiscal year for indirect cost recovery on research funded by the Federal Government, with a grand total for the 11-year period.

5. During the past 10 years, Northwestern has received $3,701,721 from the Federal Government through competitive awards for facilities construction or renovation. If more opportunities for Federal awards had existed, Northwestern would have competed for those funds.

6. Table 4 represents Northwestern's annual operating budget for the last 10 fiscal years, with a breakdown on sources of support.

7. According to the latest official figure available, Northwestern's endowment was valued at $1,145,364,000 on August 31, 1993.

II. Basic Industry Research Laboratory (BIRL)

8. Table 5 provides a history of the BIRL research funding by fiscal year from 1987 to the present, with a breakdown on sources of support and a grand total for the 10-year period. In some cases, the split between government and industry funding has been estimated, but the annual totals are accurate. Competed Federal awards account for about 30% of the total, with most of the balance from industry contracts and Northwestern start-up subsidies.

9. As indicated on page two of the September 21 testimony, Northwestern's initial impetus to seek facility funding from Congress for BIRL arose because of the high-technology task forces formed by the Governor of Illinois and the Mayor of Chicago. These panels involved high-level officials from government and industry, who were charged to examine the possible ways that high-technology might revitalize the manufacturing industries and stimulate the recessionary economy of the state and its largest city. Reporting in 1982, both task forces identified the loss of technological initiative as a major cause of declining industrial competitiveness and recommended increased university efforts to promote economic development through industry outreach and technology transfer.

After review by a Northwestern committee of upper-level administrators and senior faculty members, the University proposed establishment of the Northwestern University/Evanston Research Park, with BIRL as its anchor facility, and began a series of consultations with the Evanston Mayor and City Council, the Illinois Governor and leadership of the General Assembly, the two Illinois Senators, the District Representative, and other key members of the Illinois Delegation, and the top executives of major industrial corporations located in the state. Once the agreement had been made to proceed with the Research Park as a jointly sponsored University-City project, a Board of Directors with expertise in development and finance was appointed by the University and the City to advise the managing entity for the Research Park, and a Trustee Advisory Committee of industrial leaders was set up to monitor and advise those at Northwestern responsible for implementation of the project. When BIRL had been constructed and opened for business, the BIRL Industrial Advisory Board was created to review the appropriateness and feasibility of annual plans, as well as the effectiveness and efficiency of actual operations.

10. Table 6 lists in chronological order 65 representative R&D projects that have been conducted by BIRL to find technological solutions for industrial problems in Chicago, Illinois, and the Midwest. The association of BIRL with the

Chicago Manufacturing Center, which was recently funded by NIST to help small manufacturing companies in the Chicago area, will doubtless lead to many additional projects.

11. As indicated on pages eight and nine of the September 21 testimony, the mission of BIRL was designed to complement two aspects of the USDOE mission -- increasing the energy conservation and improving the economic competitiveness of U. S. industry. After consultation with USDOE officials, Northwestern administrators decided that the technical focus of BIRL should be materials, which are a central consideration for attempts to conserve energy and reduce cost in manufacturing. In this way, the functions of BIRL reinforce many of the materials thrusts within the USDOE Office of Conservation and Renewable Energy, especially those within the Office of Industrial Technologies and the Office of Transportation Technologies. This decision was also based upon the consideration that, among the various research areas related to manufacturing, Northwestern's greatest strength lay in materials science and engineering.

12. As indicated on page 10 of the September 21 testimony, Northwestern administrators followed specific guidelines for the grant process, as outlined in a USDOE grants management procedures booklet, submitting regular written reports, and meeting on a quarterly basis with officials from the regional

office of USDOE located in Chicago. After the construction of BIRL had been completed in 1988, the BIRL director has visited USDOE several times each year to keep relevant officials appraised of current BIRL research and to identify ways that BIRL can serve USDOE directly. Table 7 provides a list, chronological by agency, of selected projects competitively awarded by USDOE and other Federal agencies. This list makes clear that the goals and objectives of BIRL complement those not only of USDOE but also of other major Federal programs.

III. Biotechnology Center

13. Table 8 lists funding data from FY1991 to FY1994 for faculty housed in the Biotechnology Center facilities, with a breakdown on funding sources and a grand total.

14. Northwestern's Biotechnology Center was established in FY1990 with a $700,000 competitively awarded grant from the Illinois Technology Challenge Grant Program. The purpose of the grant was to provide initial funding to create, staff, and provide equipment for a Northwestern organization that would coordinate and expand faculty research in biotechnology, develop new graduate training programs in biotechnology, and promote industry outreach and technology transfer in biotechnology. The proposal included an assessment not only

of Northwestern's strengths but also its limitations because of inadequate and outmoded laboratory space, which prevented the hiring of new faculty and threatened the acceptance of future large-scale funding. The merit review was performed by a panel composed of leading scientists and upper-level executives from Illinois universities and corporations, who not only funded the center but also endorsed the importance of seeking external funds to address the facilities problem.

As indicated on page 10 of the September 21 testimony, the proposal to receive funding from USDA for Northwestern's Biotechnology Center facilities project was subjected to a merit review by a CSRS panel, which included two CSRS officials and three life scientists from major Midwest universities. The panel concluded that the proposal was for "an important, necessary facility, which has the potential to increase the capacity at Northwestern University for research discoveries that could have significant, long-term impact on U. S. agriculture". The activities of the Biotechnology Center continue to be monitored and advised on a regular basis by an internal committee of Northwestern life scientists and an external committee of industrial scientists and executives in charge of research.

15. Most biotechnology research at Northwestern is fundamental in nature, focused at the molecular level, and capable of various

applications. However, the Biotechnology Center has targeted its graduate training internships and its other efforts at industrial outreach and technology transfer in three areas: biomedical and health care; agriculture and food processing; and environmental bioremediation. Considering the Federal agencies responsible for these three areas, the Northwestern faculty members and administrators involved in preparing the Biotechnology Center proposal thought the best match was with USDA. Table 9 provides data on all research and facilities grants from USDA to Northwestern for the past 10 years. However, as recognized in the CSRS facilities panel report, given the molecular-level focus of Northwestern's biotechnology research, increased research funding from USDA may depend upon whether "significant funding" is "made available to the National Research Initiative".

16. As indicated on pages 9-10 of the September 21 testimony, the Biotechnology Center facilities proposal described in detail six areas of basic research at Northwestern relevant to the mission of USDA:

- Animal development and genetics -- studies into the biochemistry and physiology of animals on topics such as pituitary growth hormone, growth-hormone-releasing hormone, and regulation of gene expression during animal development;

- Hormones and reproduction -- investigations on hormones that regulate stages in the reproductive cycles of animals, lactation, and circadian rhythm;

- Drugs, vaccines, and disease and pest control -- studies that explore the structure and transport of animal viruses, their serological properties, and the application of this knowledge to prevent and cure infection;

- Food processing and storage -- research on such topics as fermentation in food processing for the purpose of reducing spoilage, and neuronal pathways of odor and taste for the purpose of increasing the appeal of foods;

- Plant productivity -- investigations on the biochemistry and physiology of plant growth and development in areas such as potassium transport systems, sulfa metabolism, nitrogen fixation, and photosynthesis;

- Environmental detoxification -- genetic and biochemical examination of organisms with the capacity to detoxify environmental pollutants such as mercury and other heavy metals.

The CSRS facilities study panel cited projects in these six areas as evidence "that well demonstrates the considerable ability of the faculty to undertake biotechnology research of significance to agriculture".

17. Northwestern administrators and faculty remain hopeful that Congress will complete the proposed funding for the Biotechnology Center facilities project. If Congress were to discontinue funding, Northwestern would have to deal with that contingency when it arose. The obvious alternatives would be either stopping the final phases of the project until other funds are available or proceeding with the final phases through additional debt financing.

18. When Northwestern first sought Federal assistance for its Biotechnology Center facilities project, no one assured the University that the full $12 million requested would be awarded. However, belief in the merits of this proposal, which were upheld by the CSRS review panel, encouraged the proposers to think that those who had helped Northwestern secure the initial funding would continue to support the project in future sessions of Congress. The current plan is to continue the project on schedule through debt financing with the hope that more substantial grants, like the award for FY1995, will be voted by Congress in the future.

TABLE 1. NORTHWESTERN PAYMENTS TO CASSIDY & ASSOCIATES

Fiscal Year	Amount
1984	$ 180,000
1985	285,000
1986	360,000
1987	360,000
1988	360,000
1989	360,000
1990	360,000
1991	360,000
1992	360,000
1993	360,000
1994	360,000
Total	$3,705,000

TABLE 2. NORTHWESTERN UNIVERSITY RESEARCH FUNDING

	Federal Agencies	State & Other Non-Federal Agencies	Private	Grand Total
1985	$52,239,571	$1,297,766	$10,535,992	$64,073,329
1986	49,244,072	590,840	9,880,220	59,715,132
1987	61,094,688	1,224,154	13,849,510	76,168,352
1988	65,978,494	2,162,721	19,610,717	87,751,932
1989	69,452,651	2,823,028	28,482,000	100,757,679
1990	71,084,426	8,981,381	36,788,154	116,853,961
1991	75,678,649	5,972,375	40,858,564	122,509,588
1992	85,170,595	5,790,069	46,207,039	137,167,703
1993	101,991,281	3,322,930	50,009,263	155,323,474
1994	111,736,256	4,153,634	53,026,997	168,916,887
Totals	$743,670,683	$36,318,898	$309,248,456	$1,089,238,037

TABLE 3. NORTHWESTERN RECOVERY OF INDIRECT COST ON RESEARCH SUPPORTED BY THE FEDERAL GOVERNMENT

Fiscal Year	Amount
1984	$ 10,992,234
1985	11,028,876
1986	11,727,235
1987	12,501,286
1988	15,199,713
1989	16,359,014
1990	16,755,151
1991	17,224,187
1992	20,001,141
1993	21,727,960
1994	21,668,748
Total	$ 175,185,545

Table 4. NORTHWESTERN UNIVERSITY ANNUAL OPERATING BUDGETS
(Dollars in Thousands)

	FISCAL YEARS									
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
REVENUES										
UNRESTRICTED										
Tuition and Fees	$141,768	$153,976	$168,210	$181,160	$198,826	$214,016	$230,794	$246,282	$262,157	$273,745
Endowment Income	20,275	20,154	20,800	21,935	25,381	18,643	19,146	19,410	18,723	19,727
Investment Income	4,871	8,750	8,685	9,509	6,324	8,175	12,000	11,892	12,077	12,685
Indirect Cost Recoveries	13,698	16,450	16,672	19,693	21,212	23,259	25,813	27,370	29,866	30,104
Gifts and State Grants	6,809	6,954	6,540	6,698	8,239	8,227	8,723	11,762	10,624	10,788
Departmental Services	32,533	33,572	36,076	35,218	67,885	73,144	73,713	75,798	78,970	81,420
Auxiliary Enterprises	29,084	29,218	29,408	31,861	33,375	34,694	37,311	46,853	48,641	51,574
Transfers In		504	1,206	3,565	12,788	22,371	20,678	27,506	28,479	29,829
Subtotal Unrestricted	$249,097	$268,578	$287,597	$309,639	$374,030	$402,529	$428,178	$465,873	$499,537	$509,872
DESIGNATED FUNDS	$30,450	$31,668	$32,935	$35,639	$14,345	$38,701	$36,625	$37,815	$29,915	$18,725
RESTRICTED FUNDS	$78,225	$81,354	$84,608	$87,222	$105,161	$133,271	$131,889	$136,175	$149,338	$156,538
Federal Grants	46,083	48,754	50,780	53,243	58,260	57,877	63,760	72,107	79,907	83,743
Non-Federal Grants	11,386	10,762	11,635	15,582	19,465	24,698	26,979	28,349	32,783	34,357
Other Restricted Funds	20,756	21,838	22,193	18,397	27,436	50,696	41,150	35,719	36,648	38,438
TOTAL REVENUES	$357,772	$381,600	$405,140	$432,500	$493,536	$574,501	$596,692	$639,863	$678,790	$685,135
EXPENDITURES										
UNRESTRICTED										
Academic Programs	$93,403	$99,644	$108,202	$119,800	$153,551	$178,252	$189,361	$203,355	$214,969	$225,872
Research Support and Adminis.		10,193	7,542	7,628	19,873	10,919	11,486	12,105	12,363	13,090
Academic Support	15,886	16,531	15,561	15,995	19,003	23,429	18,495	19,419	20,139	21,559
Student Services	18,930	13,463	21,689	22,745	21,159	26,221	27,655	28,787	29,689	30,751
Institutional Support	23,391	37,532	37,553	40,317	43,920	41,820	50,654	54,594	56,311	59,770
Plant Operation and Maint.	31,333	22,031	21,806	22,053	23,027	26,314	28,398	30,019	30,426	31,355
Scholarships and Fellowships	35,261	36,109	42,240	45,256	48,090	51,475	54,826	58,573	61,409	64,120
Auxiliary Enterprises	29,479	28,218	29,408	31,861	33,375	34,694	37,311	46,853	48,641	51,574
Other Costs	1,421	4,857	3,596	3,984	12,032	9,405	9,992	12,168	15,590	11,780
Subtotal Unrestricted	$249,097	$268,578	$287,597	$309,639	$374,030	$402,529	$428,178	$465,873	$499,537	$509,872
DESIGNATED FUNDS	$30,450	$31,668	$32,935	$35,639	$14,345	$38,701	$36,625	$37,815	$29,915	$30,918
RESTRICTED FUNDS	$78,225	$81,354	$84,608	$87,222	$105,161	$133,271	$131,889	$136,175	$149,338	$144,345
Federal Grants	46,083	48,754	50,780	53,243	58,260	57,877	63,760	72,107	79,907	83,743
Non-Federal Grants	11,386	10,762	11,635	15,582	19,465	24,698	26,979	28,349	32,783	34,357
Other Restricted Funds	20,756	21,838	22,193	18,397	27,436	50,696	41,150	35,719	36,648	26,245
TOTAL EXPENDITURES	$357,772	$381,600	$405,140	$432,500	$493,536	$574,501	$596,692	$639,863	$678,790	$685,135

TABLE 5. RESEARCH FUNDING FOR BIRL

(Dollars in Thousands)

Fiscal Year	**Federal Agencies**	**State & Local Agencies**	**Industry**	**Northwestern University**	**Grand Total**
1987*	$ 0	$ 0	$ 0	$ 547	$ 547
1988	0	60	118	2,223	2,401
1989	210	0	311	2,899	3,420
1990	99	125	898	2,888	4,010
1991	1,341	200	1,881	1,520	4,942
1992	1,970	413	2,542	1,289	6,214
1993	2,818	172	2,990	518	6,498
1994	3,986	189	1,965	972	7,112
Totals	$10,424	$1,159	$10,705	$12,856	$35,144

* BIRL opened for business in the fall of 1987, but was not fully operational until the summer of 1988.

TABLE 6. BIRL PROJECTS DESIGNED TO FIND TECHNOLOGICAL SOLUTIONS FOR INDUSTRIAL PROBLEMS AND ASSIST IN THE REVITALIZATION OF INDUSTRY IN THE MIDWEST, ILLINOIS, AND CHICAGO AREA

Project Scope	Type of Industry Providing Funds	Location of Sponsor
Eliminate contamination in metalforming operation	Metalworking	Chicago
Reduce scrap rate in punching operation	Metalworking	Chicago
Develop wear-resistant coating for cutting tools	Tool coating	Midwest
Evaluate control system for process to produce hard coatings	Coating equipment	Midwest
Solve problem of high contact resistance	Electrical equipment	Chicago
Develop materials for arc suppression	Electrical equipment	Chicago
Develop method for reducing electroplating wastes	Electroplating	Chicago
Develop control system for atmosphere furnace	Heat treating	Chicago area
Conduct conference on the research needs of the steel industry[6.1]	Steel	Midwest
Develop method for producing hard coatings on high-speed steel	Coating services	Midwest
Develop method for eliminating arcing in microwave ovens	Packaging	Chicago area

TABLE 6. CONTINUED

Project Scope	Type of Industry Providing Funds	Location of Sponsor
Evaluate sintering aids	Chemical	Midwest
Develop method for reducing wear of compression parts	Appliance	Chicago area
Develop method for assessing electrostatic degradation of materials	Packaging	Chicago area
Develop barrier films for polymer materials	Appliance	Midwest
Develop clad powders for thermal spray	Equipment manufacturer	Midwest
Develop hard coatings for forming dies	Packaging	Chicago area
Develop nonpoluting method for transparentizing paper	Office supplies	Chicago area
Develop insulating coating for manufacturing equipment	Automotive	Midwest
Evaluate contamination from water coolers	Appliance	Illinois
Develop method to recover copper form electroplating bath	Chemical	Midwest
Evaluate new thermal spray process	Chemical	Chicago area
Develop wear-resistant coatings for piston rings	Automotive	Midwest

TABLE 6. CONTINUED

Project Scope	Type of Industry Providing Funds	Location of Sponsor
Develop automated inspection system for tire tread	Automotive	Midwest
Develop method for coating aluminum powder with titanium	Aerospace	Midwest
Develop process for consolidating metal and ceramic powders	Material producer	Chicago
Determine cause of failures in electronic components	Aerospace	Chicago area
Evaluate process for recycling waste	Healthcare	Chicago area
Develop automated identification and marking system for tire tread	Automotive	Midwest
Prepare metal-matrix composite materials	Consulting	Chicago area
Develop process for making composite pipe liners	Material supplier	Chicago area
Develop method for measuring temperature and moisture in food products	Equipment manufacturer	Chicago area
Analyze conductive epoxy materials	Aerospace	Chicago area

TABLE 6. CONTINUED

Project Scope	Type of Industry Providing Funds	Location of Sponsor
Develop method for 3-D imaging of ceramic components	Equipment manufacturer	Chicago area
Develop method for coating x-ray equipment with lead	Healthcare	Midwest
Develop improved mold materials for making tires	Automotive	Midwest
Evaluate fatigue properties of gears	Energy	Chicago area
Develop wear-resistant coatings for aluminum	Aluminum	Midwest
Develop low-cost CO sensor	Energy	Chicago area
Develop thermodynamic data related to coating processes	Automotive	Midwest
Develop wear-resistant coating for pistons	Automotive	Midwest
Develop wear-resistant coatings for diesel-engine parts	Automotive	Midwest
Assist in development of biocompatible coatings	Healthcare	Chicago area
Evaluate new, energy-efficient engine design	Automotive	Chicago area
Develop laser-cladding method for engine parts	Automotive	Midwest

TABLE 6. CONTINUED

Project Scope	Type of Industry Providing Funds	Location of Sponsor
Provide analytical services related to ceramic engine parts	Automotive	Midwest
Evaluate composites as replacement for metal parts in drive train	Automotive	Chicago area
Determine rate of crack growth in bridge components	Consulting	Chicago area
Determine cause of roll failures	Metalworking	Midwest
Develop surgical laser waveguides	Healthcare	Chicago area
Develop erosion-resistant coatings for polymer-matrix composites	Aerospace	Midwest
Evaluate the structural integrity of vehicular liquid-natural-gas tanks	Energy	Chicago area
Evaluate the effect of induced alternating currents on pipeline corrosion	Energy	Midwest
Develop preventive measures for induced voltages in railroad systems from power lines	Energy	Chicago
Develop method for prolonging life of factory components	Material supplier	Chicago

TABLE 6. CONTINUED

Project Scope	Type of Industry Providing Funds	Location of Sponsor
Conduct friction and wear tests on coated components	Coating services	Midwest
Develop wear-resistant coating for brass molds	Automotive	Midwest
Develop novel superhard coatings	Coating services	Midwest
Evaluate composite materials for biomedical applications	Healthcare	Chicago area
Assist with selection of plasma-coating equipment and train operators	Coating services	Midwest
Assist small companies in identifying useful technologies from federal laboratories	Consulting	Midwest
Develop manufacturing method for making locks from composite materials	Manufacturing	Chicago area

TABLE 7. SELECTED COMPETITIVELY AWARDED PROJECTS ILLUSTRATING HOW THE GOALS AND OBJECTIVES OF BIRL COMPLEMENT THE MISSIONS OF USDOE AND OTHER FEDERAL PROGRAMS

Sponsoring Agency	Project Scope
DOE	Determine the tribological properties of reactive sputtered nitrides
DOE	Synthesis and characterization of superhard polycrystalline superlattice coatings
DOE	Feasibility study on pulverization of commingled plastic waste
DOE	Carburization of tantalum by chemical vapor deposition
DOE	Coating of crucibles with titanium-zirconium boride and hafnium carbide
DOE	Chemical-vapor-deposition coating of reactor components
DOE	Development of high-voltage capacitors
DOE	Development of continuous-fiber ceramic-matrix composites
DOE	Production of high-parity nickel tubing by chemical vapor deposition
DOE	Performance of new materials for polymer-electrolyte batteries
NASA	Design and construction of chemical-vapor-infiltration system for producing composite materials
NASA	Development of coatings to prevent wear and corrosion of bearings
NASA	Development of a tough, corrosion-resistant bearing steel

TABLE 7. CONTINUED

Sponsoring Agency	Project Scope
NASA	Development of a mirror-array telescope
NASA	Development of a method for coating quartz wool with nickel for the space station
DOT/FHWA	Safe removal of lead-based paints from bridges
DOT/FHWA	Training program on electroslag welding of bridges
DOT/FHWA	Development of high-strength, weldable steel for bridges
DOT/NHTSA	High-speed photography of collision tests
SHRP	Design and construction of automated pavement-repair vehicle
DOD/ARPA	Ceramic-coated bearings
DOD/ARPA	Elimination of waste from hard-chrome coating operations
DOD/AF	Development of oxygen-barrier coatings
DOD/AF	Deposition and characterization of carbon nitride coatings
DOD/AF	Coating of fibers for metal-matrix composites
DOD/Army	Design of advanced steel for aircraft armor
DOD/Army	Gear-processing technology for improved performance
DOD/Navy	Development of sensor and control system for care of polymer-matrix composites
DOD/Navy	Development of sensor and control system for resin transfer molding

TABLE 7. CONTINUED

Sponsoring Agency	Project Scope
DOD/Navy	Assistance to the Great Lakes Composites Consortium in operation of the teaching factory
DOC/NIST	Preparation of monograph on advanced surface treatments
U.S. Postal Service	Automated inspection and process-control systems for printing stamps

TABLE 8. RESEARCH FUNDING FOR FACULTY LOCATED IN BIOTECHNOLOGY CENTER RESEARCH FACILITIES

	Federal Agencies	State & Other Non-Federal Agencies	Private	Grand Total
1991	$13,791,193	$0	$1,453.336	$15.244.529
1992	14,051,941	310.000	2,458.314	16,820.255
1993	16,075,869	7,925	2.276,756	18,360.550
1994	15.514,049	5.996	2.721,472	18,241,517
Totals	$59,433.052	$323.921	$8.909.878	$68.666,851

TABLE 9. NORTHWESTERN UNIVERSITY USDA FUNDING FOR LAST TEN FISCAL YEARS

Agency No.	Total
58-1907-1-129	$ 36,000
86-CRCR-1-2103	126,028
87-CRCR-1-2430	170,000
87-CRCR-1-2553	4,000
90-37120-5604	50,000
91-37203-6608	290,000
91-37203-6890	67,000
91-37305-5999	100,000
92-33652-7344	1,893,440
93-37206-9642	152,628
93-37305-9623	50,000
94-37203-0846	93,331
Total	**$3,032,427**

ACADEMIC EARMARKS—PART III

THURSDAY, SEPTEMBER 22, 1994

House of Representatives,
Committee on Science, Space, and Technology,
Washington, DC.

The committee met, pursuant to call, at 9:30 a.m. in room 2318, Rayburn House Office Building, Hon. George E. Brown, Jr. (chairman of the committee) presiding.

The Chairman. The committee will come to order.

Let me invite all of the witnesses this morning to also come up at this point. I have a very brief opening statement, and then I'll ask our distinguished colleagues to introduce the witnesses that are appropriate. And I will also invite them to join us here at the podium if they desire to remain during any part of the hearing, although I recognize that they are both very busy gentlemen.

The Congress, as I've commented earlier, are in the last stages of a rather hectic session and Members are deployed all over the Capitol trying to put the finishing touches on important legislation. I know Mr. McDade and Mr. Kennedy are involved in that process as are other Members of our own committee. And we will just proceed with the situation as it is.

Today marks our second day of testimony on the issue of academic earmarks, which is one that we have been pursuing for a number of years. Yesterday, for the Administration, we heard from the Office of Science and Technology Policy, the Department of Energy, and the Environmental Protection Agency. We also took testimony from three outstanding universities that have been the recipients of Department of Energy earmarks.

Today's testimony will come from four schools which received earmarks from the Department of Defense's appropriations bill for FY 1992. What makes these cases so interesting is that they are from the handful of earmarks that were included in statutory language. And for those of you who are not familiar with the distinction, earmarks occur in both statutory language and also in the report which accompanies the statutory language. And the amount of earmarks in the statute has been decreasing rather dramatically, and the earmarks in report language has been increasing. There are strategic reasons for this which we need not go into at this particular time.

The earmarks for the four schools appearing before us today were a part of a defense appropriations bill. However, also included in a subsequent statute was a binding requirement that these projects be subject to peer review by the Department and that the

Secretary of Defense certify that the proposals represent top-flight science and meet departmental needs.

This charge to the Department of Defense resulted in an internal process to review the earmarked projects and to pass judgments on their merits. The proposals submitted by the schools appearing before us today initially received reviews by the Department that were uniformly critical and they were denied funding. Yet, ultimately following a subsequent review process all three were funded.

The committee wants to learn how this review of earmarked projects work. We also hope to shed light on how projects which were initially turned down for funding were ultimately approved for funding.

The witnesses today cannot fully explain this process, because they are not privy to the internal workings of the Defense Department. But the committee will also be taking testimony from the Deputy Secretary of Defense, Mr. John Deutch, on October 6th.

Dr. Deutch wanted to join us today, but he is engaged elsewhere with a pressing obligation. We appreciate his willingness to appear at a later time, and we ask the indulgence of other Members in waiting till October 6th for any questions they may have for the Department.

Let me also add that this is not an adversarial hearing this morning. We learned yesterday that the earmarks of the three universities that we considered were all outstanding projects, and some of the universities pointed out, and I concur with them, that the problem is not so much with the universities and their earmarks as it is with the processes of the Congress. And we're trying to shed additional light on how we can improve the processes in the Congress.

Some of what goes on under the rubric of earmarks, which can be sort of a dirty word in the minds of some people but is not necessarily so—some of what goes on is due to a failure by the Congress to act in accordance with more appropriate procedures for establishing a process for funding necessary academic infrastructure and facilities.

With those words I would like to recognize Mr. Rohrabacher for the minority for any statements that he may have.

Mr. ROHRABACHER. I'll make this very, very short. Mr. Chairman, I am very pleased to be with you today and to be with you on this issue. The chairman has a long-standing concern about the integrity of the process that we have in terms of spending money here in Congress.

And again, let me emphasize something that the chairman just stated. His concern, my concern, our concern is not that the universities and colleges that we're talking to have done anything wrong themselves. We're not making—there is no finger being pointed at people who have worthwhile projects and are trying to get them funded.

What we are trying to do here and what the chairman's intent is—and you can correct me, Mr. Chairman, if I'm wrong—is that we want to make sure that the system is working as it is set out, so that when we have limited funds here in Congress with which to—to deal with, that the priorities are set in the way that Congress has established that priorities will be set and that that is done in a systematic way, and that money is provided for grants in a way that is consistent with the process that they want, but that the process was set up so that merit rather than politics is what ends up making the decision.

So, I have been beside the chairman with great pride in a number of these struggles to make sure that the process here is working and the integrity of the process is maintained in Congress. This is another one of those efforts and I'm very pleased to join him this morning.

The CHAIRMAN. I appreciate those sentiments.

To put in colloquial terms the nub of the problem here, we who serve on authorizing committees would like to participate in the process of determining these priorities as the rules of the House require. In part, we want a piece of the action.

And we respect the wisdom and the good judgment of our colleagues on the Appropriations Committee, but continuation of their earmarking for unauthorized projects merely erodes the influence of 85 percent of the Members of the House who don't serve on Appropriations.

I say this with respect to my good friend, Mr. McDade, who has a long and distinguished history here and of serving his constituency well. And they should appreciate him for this, I can assure them.

With that, let me ask Congressman McDade, who is the senior Member here, if he would introduce the witness who comes from his district. And if he can remain after that, we'd appreciate it. If he can't, we will be glad to excuse him.

Mr. MCDADE. Thank you, Mr. Chairman. I'm grateful for the opportunity to be here and to introduce to you and to my colleague, Dana Rohrabacher, and other members of the committee and the staff a magnificent person that I have been privileged to know for a good deal of my life, the President of Marywood College, Sister Mary Reap.

In addition to her vocation, Sister Mary has an exemplary record as an educator and an administrator. She spent the past 28 years as a teacher at all levels from grade school through graduate school. Her education and training experiences have taken her from Pennsylvania to the Caribbean to Spain to the People's Republic of China.

Sister Mary is entering her 7th year as the President of Marywood College, and for those of you who are not familiar with Marywood College, it is in Scranton, Pennsylvania, and we will soon be celebrating its 80th anniversary as an academic institution.

Marywood has long been recognized for its academic reputation and has grown from the leading—from being the Nation's largest Catholic women's college in the 1960's to the largest source of graduate education in northeastern Pennsylvania. Its emphasis on advanced study and professional career development is evidenced by the fact that over 40 percent of its students today are graduate students.

Mr. Chairman, before I turn it over to Sister Mary I'd like to make just a few comments on the research that Marywood is doing for the Department of Defense. Quality of life for our service people and their families has always been a top priority at the Pentagon and in the Congress, and today the quality of life in the military is being challenged as never before in its history.

Today, 6 out of 10 service people are married. There are over 80,000 single parents in the services, and with greater opportunities for women opening up in the military, new problems are cropping up regarding child care and family separation.

Add to this a disturbing number of new trends and increase of spouse abuse in military families, 23,000 incidents last year alone; thousands of military families now eligible for food stamps and existing on them because of the cuts in the military cost-of-living adjustments, an impossible situation; and top that off with increased pressure on military families caused by the huge cutbacks in the force at the same time overseas deployments have been increasing and ratcheting up every hour on the hour.

To attract and to keep the top-notch kind of volunteers that we need for our all-volunteer force, we have an obligation to stay on top of the problems confronting the military families, and that is the reason behind Marywood's involvement with the Pentagon.

And I think you will see and learn that Sister Mary and the college are working hand in hand, may I say, Mr. Chairman—hand in hand with the Pentagon to address the problems that face our military families today.

Mr. Chairman, I am delighted to have the opportunity and it is a great privilege for me to sit here with Sister Mary Reap, and on her first appearance in front of this committee, and I am not sure if there are other committees in Washington, to present her to the convivial arms of my distinguished friend from California and my distinguished associate from California.

Sister Mary Reap.

The CHAIRMAN. Sister, we're going to allow Mr. Kennedy to introduce Dr. Silber first, and then we will proceed with the witnesses. But I want to assure you that we welcome your presence here this morning. We hope it will be a learning experience in which we can learn how to work together to improve both the kind of work that you are doing and you can help us to improve the kind of work that we're doing here.

May I now turn to Mr. Kennedy, the distinguished Member from Massachusetts, and ask him if he would introduce our distinguished witness from Massachusetts.

Mr. KENNEDY. I'd be delighted, Mr. Chairman. And I want to thank you very, very much for your consideration in allowing me to come before this distinguished committee this morning.

I think everybody in the Congress recognizes the tremendous contributions that you have made in terms of our overall technological breakthroughs, and anyone that is familiar with job creation in the United States today realizes that it is only through these technological breakthroughs that we see significant jumps in productivity, which is how ultimately we create the best jobs that Americans can go after. And I very much want to thank you for the leadership that you've provided.

And I just want to also say thank you to Dana Rohrabacher, who after—6 years we've served together? That after 6 years Dana and I finally found an issue that we agree on. And it was difficult, but there is an issue which actually Dr. Silber I'm sure probably has a strong opinion on as well, which is the problems of patents being given away under the GATT agreement to particularly the Japanese, where much of the research that might be provided through this committee to universities and the like where we make significant breakthroughs are not protected under the GATT agreement, and therefore huge amounts of taxpayer dollars end up going for naught. And so Dana and I are working together to try to clarify some of those issues as we move forward.

In any event, I am here with great pleasure and an honor to introduce someone who has made significant contributions both to the academic world and to the political world. John Silber entered politics at a very young and early age by taking on discrimination at the University of Texas, where he continued on and led that university before coming up to Massachusetts and just making tremendous contributions to Boston University.

I happen to represent, I think, more universities than any other Member of Congress. I got more universities than you can shake a stick at.

But BU since—just in the last several years under Dr. Silber's leadership, research has gone up over 10 times, the endowment is up over 18 times, SAT scores have gone up almost every year. They have taken on many significant local issues, including a very controversial takeover of the poorest community in my district, the Chelsea school system. Chelsea is one of the only communities in America that actually went bankrupt, and BU has gone in and tried to help out with the school system there. So, there has been a tremendous contribution that he has made to our State and to our country.

And I'm just delighted to be here this morning to have an opportunity to introduce him. He is here to talk about the Photonics Center at Boston University as an example of the kind of effort that I hope this committee could see its way to designating for specific funding. The Center is a leading-edge technology facility designed to take on the ideas on the practical use of laser technology and other light-based technologies that have been proven in research labs and bring them to the marketplace as soon as possible.

We see examples all around the United States through laser printers, CD players, data storage, as well as laser surgery—just to name a few. None of these existed 10 years ago.

The Center's goal is to create business arrangements between researchers and business and to bring new products to the market as fast as possible. Where existing businesses don't exist, the universities will go out and try to create it. It means new jobs. It means new wealth for our country.

Photonics is now a $75 billion a year business. It'll triple over the course of the next 10 years.

This is exactly how I think the people of our country begin to recognize that when they pay taxes and we put those funds into research that that translates into real jobs. That this is one of the few areas where the country actually makes money out of the taxes that we ask the American people to pay.

So, I think Dr. Silber knows much more about the specifics, obviously, Mr. Chairman. But I am really delighted that you have asked him to come and testify before your committee. And I wish I could stay for his testimony, but as you pointed out, we've got a lot going on and I got a committee that starts in 1½ minutes, so I'm out of here.

The CHAIRMAN. Thank you very much, Mr. Kennedy.

Our distinguished ranking Republican member was here briefly, and if he comes back I will recognize him for any additional statements that he wish to make.

We will start this morning with Dr. Silber, and in view of the glowing introduction that he has had I don't think that I can add anything further. He is well recognized for his leadership in the academic field. He has on occasion said some things that are rather controversial, but he seems to delight in that and we welcome it. I say a few controversial things myself once in awhile.

And we will allow you to proceed at this point, Dr. Silber. You don't need to go through your whole statement, but you may if you wish. If you can abbreviate it, fine.

And I want to hear from each of the witnesses and then we will interrogate them as a panel.

With regard to the witnesses from Texas, I might say that both Mr. Wilson and Mr. Chapman have been contacted, or have contacted the committee on your behalf, and certainly we want to extend every courtesy to you, and if they can be here we will recognize them to say some nice words about Texas.

Mr. COVINGTON. Thank you, sir.

The CHAIRMAN. All right, Dr. Silber, you may proceed.

STATEMENT OF JOHN R. SILBER, Ph.D., PRESIDENT, BOSTON UNIVERSITY, BOSTON, MA; SISTER MARY REAP, PRESIDENT, MARYWOOD COLLEGE, SCRANTON, PA; BILLY C. COVINGTON, Ph.D., ASSOCIATE VICE PRESIDENT FOR RESEARCH AND SPONSORED PROGRAMS, SAM HOUSTON STATE UNIVERSITY, HUNTSVILLE, TX; R. SCOTT BEASLEY, Ph.D., DEAN, COLLEGE OF FORESTRY, STEPHEN F. AUSTIN STATE UNIVERSITY, NACOGDOCHES, TX

Mr. SILBER.[1] Mr. Chairman, I appreciate the opportunity to address this committee—Mr. Chairman, I welcome the opportunity to address this committee and thank you for the invitation.

We have submitted a 31-page report to answer the five questions that you have raised. I will not read the report. Obviously, it is impossible for me to summarize it in only 5 minutes.

The CHAIRMAN. Right.

Mr. SILBER. But I will just try to hit some of the salient points.

The CHAIRMAN. You don't need to be rigidly confined to the 5 minutes, Dr. Silber.

Mr. SILBER. Thank you, sir. But I will just try to address the central issues, under the assumption that the entire report will be a part of the record, and I should like to ask that.

The CHAIRMAN. That will be done.

[The report referred to is actually Dr. Silber's prepared testimony.]

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[1] Dr. Silber has requested changes to his testimony, See Appendix B, Item 2.

Mr. SILBER. Thank you. Now, Boston University was asked first, "Why did we seek earmarked funds?" First of all, earmarking funds has been one of the ways that the United States gained leadership in physics in all its dimensions, and it was one of the reasons why the United States could prevail in World War II and in the Cold War.

As you know, through earmarking the Manhattan Project was begun at Chicago and Columbia, the Fermi Laboratory was begun at Chicago, the Lawrence Livermore and Los Alamos laboratories under the direction of the University of California, the Radiation Laboratory, the Instrumentation Laboratory, the Lincoln Laboratory at M.I.T., the Jet Propulsion Laboratory at Caltech—all of these were begun during or shortly after the second world war and provided the stimulus by which we achieved greatness in the fields of physics and applied physics and were able to develop such a powerhouse in national defense.

Four supercomputer centers were developed, largely through earmarking, at Princeton, Cornell, San Diego and the University of Illinois.

There are seven national laboratories that are funded by nonpeer review at $2 billion a year at M.I.T., Caltech, Chicago, California, Columbia, Johns Hopkins and Harvard. There are 19 Federal-funded research and development centers in this country with $6.3 billion that is done through earmarking, not through peer review.

The Agriculture Department gives out $1.44 billion a year, only 33 million of which is through earmarking.

So, we have just in these programs alone something in the order in excess of $9 billion that is done through earmarking and not through the peer review.

If there were a program by which we could find funding, adequate funding for the scientific and research infrastructure in this country through a national program, it would be wonderful. But, as all of you know, the NSF has in its budget, had in its budget last year less than $50 million by which to support research and instrumentation, and there was pitiful little money there for any kind of construction.

It has been estimated by the National Science Foundation that the shortfall in scientific and research infrastructure in the United States amounts to a deficit of somewhere between $100 billion and $200 billion. If there were to be a national authorization, legislation for scientific and research facilities in an appropriate magnitude, let's say of something well in excess of $50 billion a year, of course, all universities, I believe, and colleges in this country would support that. In the absence of such funds, however, either this country stagnates or we do what we need to do in order to serve the national interest.

So, in answer to question one, Boston University seeks—has sought—earmarked funds for the national interest to increase the number and quality of centers at which research and development takes place.

Congress recognized this when it passed the National Science Foundation Act of 1950. It said that one of the purposes was to strengthen research and education in the sciences, including independent research by individuals, throughout the United States and to avoid undue concentration of such research and education.

Now, it was naturally concentrated during wartime, and it had to be, in a relatively few places. But it is very important that we multiply the number of centers of excellence. It is in the national interest to build new centers at universities that are best positioned by virtue of size, location, commitment to excellence in academic standards, and in areas of medicine, law, management, economics, no less than science, to become national centers of excellence.

Boston University meets these criteria, and through three of these so-called earmarked funds the merit that was potential in Boston University has largely been realized.

It is also in the national interest for us to advance United States research and product development in photonics, which, as Congressman Kennedy mentioned, is a $75 billion a year industry now, and over the next 10 years is likely to become an industry of $500 billion to $750 billion.

We have serious international competitors in this field, Japan and Germany, and those governments are making major investments in research in photonics. The United States has been doing virtually nothing until this was identified by the Department of Defense as one of its seven highest strategic initiatives, one of its seven highest priorities, and consequently it is in the national interest that we try to develop these.

In question two you asked what were the benefits of these projects to the university's educational and research mission as well as any related local or State or regional benefits. It benefits our educational mission because, for example, we have the opportunity of integrating programs in physics, engineering, chemistry, biology to focus these sciences collaboratively as they impinge upon one another in the creation of new scientific discoveries that can then be translated into real products.

We're turning the cutting edge of science into marketplace solutions by which products are created either to be used in our national defense or to be sold on world markets. And then, of course, it gives the opportunity for students to master these vital areas of science and technology which are not taught widely in American universities.

It helps our research mission by virtue of this receipt of money to build the infrastructure. We are able then to go out and recruit outstanding scientists as we have done over the last few years as a result of these earmarked funds.

Through earmarking, Boston University, in physics and biology, has been able to hire 135 outstanding members of the scientific community, many of whom are members of the National Academy of Science or the National Academy of Engineering, which we never would have had before.

We have been able to use the $56.5 million we received through earmarking on these three projects, and we contributed over $100 million to it, so that the match has been $2.75 for every Federal dollar spent. But in addition, we spend $9 million a year on just faculty salaries for the 125 faculty that we hired.

In the process of having our first science and engineering center, we created four shops in electronics, in instrumentation, and so forth, and in those shops, where we hire 23 superb technicians, we do work for NASA for our space telescope, for the National Science Foundation's South Pole Astronomical Center, for Draper Laboratories, for AT&T Bell Labs, for Harvard, for M.I.T., Maryland, Michigan, Chicago, Utah, Stanford, Colorado State, Pennsylvania, Stony Brook, California-Berkeley, and incidentally even the Republic—not the Republic of China, but the People's Republic of China, Oak Ridge, Brookhaven, Fermilab, the Stanford Linear Accelerator. All of these agencies throughout this country now use the scientific machine laboratories, workshops that we developed at Boston University. So, far from just serving our interest, it has served a national interest.

It has enabled us also to provide 400 to 500 construction jobs. This latest photonics project is a 250,000-square-foot building. We received $16 million of that through earmarking. We are putting $40 million of our own money into this.

It is a part of the urban revitalization in Boston, and also is very important for regional competitiveness because our region is suffering from the defense industry conversion. We closed Fort Devens. We are shutting down many military installations in the Northeast, and this gives us an opportunity of stimulating that economy that would otherwise be more seriously depressed.

There are over 100 small companies in Massachusetts and the Northeast working in photonics, and this gives us the opportunity of focusing their efforts, giving them access to machinery, giving them access to scientific minds that they desperately need but would otherwise be far beyond their capacity.

Now, question number three asked, "How does this project relate to the funding agency's mission as well as national goals and priorities?" Well, our funding mission is the Department of Defense and photonics is a key element of the DOD's 1992 Defense Technology Plan, one of its seven highest priorities.

Photonics research is designed to provide air, sea and land platforms whereby we can provide faster, lighter, and more effective communications. If you are sending up a guided missile with electronic wiring, that can be totally disrupted by a blast, by any kind of explosion in its vicinity. If it is wired with photonics, the photonics are immune to the magnetic fields that an explosion creates, and consequently it gives those missiles survivability. That is one of the reasons why the Department of Defense is interested in this.

Moreover, photonic wiring is much lighter than copper wiring. It also provides faster computer processing, and it provides novel sensing, recognition and engagement capabilities that are important in the solving of four core problems key to national defense.

The first is the development of wideband gap semiconductor materials for high density optical data storage. Now, to try to unpack that, they are looking for a blue laser. They are looking for a blue laser that can see farther into water, that can see farther into opaque materials of the sort that you have in the atmosphere. This blue laser is now in operation at Boston University. It is one of two existing in this country, and the only other place it exists is in

Japan. This will enable us to search and track functions in water far more effectively than otherwise.

We are also developing new biomolecular materials, including materials for the detection of chemical and biological warfare agents. If we can have some biomolecular materials that can sense the presence of poison gas or the presence of other pollutants that could destroy men on the battlefield or could destroy civilian populations, that is an enormous advantage and it is part of the importance of this photonics research.

The third problem is environmental sensing and photocatalysis, including mechanisms for the destruction of pollutants and the mitigation of chemical hazards. We have discovered that there are some biological properties and some light properties that catalyze these poisonous elements and transform in the process of shining light on them into something far less harmful.

Discovering the right kind of light by which you can detoxify poisonous materials or environmentally hazardous materials is of great national importance, not only militarily but also in terms of civilians.

Photonic links among supercomputers are very important. If we can link computers, let's say in Boston and Washington, D.C., and Seattle through photonics, by a linkage that goes with the speed of light, this will greatly increase not only the power of computers but their survivability in case of war, because then you don't have to locate your computer facilities all in one place where they are close to one another.

And this is one of the reasons, by the way, for microscopic computer design. They're trying to make them smaller and smaller because as they get smaller they get faster. By the use of photonic linkage, we can create speed. As you know, 186,000 miles per second is pretty fast, and that is the potentiality of photonic linkage.

Now, a photonics center contributes to other national needs. We're developing dual-use technologies, technologies that are important to the Department of Defense, but that are equally or perhaps even more important to civilian commercial and industrial applications.

This increases the value of investment capital by all of these small companies, or even large companies, by reducing the R&D time, by reducing the cost of R&D since it is now taken over by university functions.

It also reduces risk and wasted effort. And most important, it reduces the time of basic discovery to the point where you reach the market with a new product. And last but not least, we are training students who know how to do these things and will be qualified to enter American industry contributing their knowledge and know how of the linkage between science and products in a way that we've never had before.

Fourth, you asked the protocol we've developed with the Department of Defense to monitor progress. Well, the Department of Defense is properly all over us and we are working closely with them.

They have to give approval for all of our equipment purchases. We file justifications for all major subcontracts and they have to review those. We submit an annual technical report. We submit a final technical report. And we submit a final financial status report on how every penny has been spent and what's been done with it.

There are also voluntary protocols. Those that I have listed above were stipulated under the contract. The voluntary protocols that we've developed are as follows:

We submit quarterly technical and program reports. We solicit counsel from the Department of Defense grant monitor. We meet with the DOD grant monitor for discussions of the grant at regular intervals. We work with the Boston regional office of the granting agency. We give briefings to DOD, NASA and many State and industrial organizations on the Photonics Center and on its activities, and we also meet with companies and encourage their collaboration with us.

We coordinate with the EPA and other State and local agencies to ensure that the Boston University and the DOD are complying with all pertinent Federal, State and local statutes.

Your final question was the reasons that we believe have led to proliferation of academic earmarking and what procedures need to be established to address this situation. Well, it won't surprise you to note that I don't believe anything needs to be done about earmarking per se, because I believe it is the right way for Congress to address problems that otherwise would simply go unattended to.

As I said earlier, if we had a procedure by which to support scientific and research infrastructure in a magnitude sufficiently large, $100 to $200 billion is needed, if we had that then there would be alternatives.

Right now we are not in any competition on peer review because peer review has never been used with regard to research facilities and basic instrumentation. That has been done by earmarking right along.

Peer review is used for the determination of which individuals should receive research grants on the basis of their individual scientific competence, and on that score we firmly believe in supporting peer review, and indeed we've done so.

At Boston University when I came there we were doing $12 million a year in peer review research. Today, we do $146 million a year in peer review research. At the time that—in physics, biology and engineering—at the time our first earmarked grant was given in 1985 we were doing approximately $5 million of peer review research in those departments. Today, those departments are doing $21 million in peer review, in less than 9 years, because of the way in which the acquisition of the infrastructure enabled us to hire the truly outstanding scientists.

Now, out of the total amount of money spent on research and science and development of about $76 billion a year, the grant to Boston University of $29 million is what I believe the Congress refers to as decimal dust. Well, at Boston University we've turned decimal dust into diamond dust for the benefit of this country. We have more than matched it and we continue to match it by the acceleration and improvement of our faculties.

The modern structure of American science exists because of congressional decisions to invest in technology. I reviewed those at the beginning. The opponents of earmarking are simply bent on protecting their own piece of the pie. The AAU has members whom I listed above, you all know them, M.I.T., Caltech, Chicago, Columbia, Johns Hopkins, Cornell, and so forth. They're all great beneficiaries of earmarked funds, but they're also great beneficiaries of NSF peer review funds and they would naturally prefer it if they had no competitors.

As we have these grants and we enter the competition for NSF funds on peer review, we improve the quality of peer review. We increase the competition for peer review. We put more and better scientists into the game for peer reviewed funds.

Now, if I were a member of the establishment, I would vote to exclude all new members. Perfectly understandable. But at Boston University we are determined to get into the establishment, and we have found that earmarking was a highly effective way to do it.

And I would say that a congressional procedure that gets such good results as the results I have described from the earmarking of funds to Boston University has much to commend it. It has much to commend it on the basis of merit, not on the basis of anything contrary to merit.

Congress it seems to me has not only the right but the obligation to earmark, because Congress is the only appropriate body to decide how Federal tax dollars should be spent, and it is the only peer when it comes to assessing what is in the national interest.

If we're not going to turn to the Congress itself to determine whether it is in the national interest to build a photonics center, then who are we going to let decide? Harvard, M.I.T. and Cornell? Are we going to turn the government of the United States over to the presidents of a few universities? As far as I'm concerned, I'd rather leave it in the hands of the Congress.

I hope that the Congress will as circumstances warrant expand the practice of earmarking, and I don't see that there has been a shred of evidence to show that the quality of peer review research has been in any way endangered. In fact, I think it has been enhanced by the presence and award of earmarking funds.

Thank you, sir.

The CHAIRMAN. Thank you, Dr. Silber.

Obviously, you bring deep passion to the cause, and there is not much in what you say that I can disagree with, but I will make a few points later on in which we have some disagreements.

[The prepared statement of Mr. Silber follows:]

Testimony of

John R. Silber
President, Boston University

before the

Committee on Science, Space, and Technology
United States House of Representatives

Washington, D.C.
September 22, 1994

Mr. Chairman: I am pleased to have this opportunity to testify before the Committee on Science, Space, and Technology on the subject of Congressional "earmarking" of funds for colleges and universities.

What Is "Earmarking?"

To answer clearly the questions you have asked, I must begin with some remarks about the word "earmarking," which is sometimes used to mean the diversion of public monies to particular, narrowly-defined and questionable projects. Like its polemical cousin, "pork barrel," the term earmarking is not used as praise. Earmarking is so often spoken of in a tone of righteous indignation that the ordinary citizen not versed in the terminology of Capital Hill must think that it refers to something shameful.

In fact, earmarking is just ordinary legislation.

Some Members of Congress and journalists seem to think that these bills get passed in the same way that sinners, in the words of a seventeenth-century theologian, "pass as ear-marked slaves of Satan."[1] According to this view, if a piece of legislation allocates funds to a particular recipient, that legislation must be assumed to be contrary to the public interest, at least until proven otherwise. That view is misguided. Like all other legislation, earmarked legislation can be good or bad, depending on what it does. The real question is whether the aims and results of any given appropriation are in the national interest.

Boston University has sought congressional assistance through legislation in order to create the infrastructure—buildings and equipment—necessary to do research at the frontiers of science and technology. The creation of new centers of excellence in research is an essential investment for the country if we are going to maintain a strong national defense in an era of high-tech warfare, and if we are to remain prosperous and competitive as a nation in a global, technology-driven economy.

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[1] Richard Carpenter, The Soules Sentinel, 1612.

Direct Congressional Support for Science Facilities Is Not New

During World War II and through the early decades of the Cold War, Congress understood the importance of building a research infrastructure second to none. Beginning with the Manhattan Project at Columbia University and the University of Chicago, the United States Government through earmarking directly created a university-based infrastructure for advanced scientific research. Our nation's supremacy in high energy physics arose from the work at Fermi Lab, at the University of Chicago, and the research at the two University of California laboratories, Lawrence Livermore and Los Alamos. Advanced guidance systems were the product of the government-funded Instrumentation Laboratory at the Massachusetts Institute of Technology. M.I.T.'s government-funded Radiation Laboratory was started in World War Two to perfect radar, and Lincoln Laboratory, also at M.I.T., was founded in 1952 to develop the radar Defense Early Warning system for North America. Our nation's planetary exploration programs grew out of and have remained centered in one federally-funded facility at a research university: the Jet Propulsion Laboratory at the California Institute of Technology.

During this period the Government also created another category of assistance to higher education: broad-based programs intended to ensure the establishment of new centers of scientific excellence at other colleges and universities. In 1963, Congress passed the Higher Education Facilities Act (P.L. 88-204) which included grants for the construction, rehabilitation, and improvement of classrooms, laboratories, and libraries for undergraduate and graduate schools. This followed other measures, such as the Housing Act of 1959, which included a section (section 112) which authorized federal grants to urban colleges and universities to acquire land and build new facilities. Between 1950 and 1962, about 900 colleges and universities received low interest loans for the construction of dormitories, cafeterias, and other components of basic educational infrastructure.[2] Responding to the call to broaden the base for scientific research, Congress in the early 1960s created the Science Development Program, the College Science Improvement Program, and the Experimental Program to Stimulate Competitive Research, all of which were administered through the National Science Foundation.

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[2] The Encyclopedia of Education. 1971. p. 552.

The National Interest Requires Renewed Congressional Support

The federal initiatives that created these programs and others like them are, unfortunately, a thing of the past. Most of them have not been maintained, and, in the last 25 years, they have not been replaced.[3] The laboratories I have mentioned, to be sure, continue and have justified many times over the investment the government made in them. Technology, however, has not stood still during this quarter-century and neither have our competitors. The United States cannot be satisfied with its existing research base. We must broaden and deepen that base if we are to survive in a world in which other nations are poised to exploit every scientific advance the moment it becomes known.[4]

How the U.S. Has Benefited from Past Support to Boston University

In this context, Boston University has sought help three times from Congress to establish new research facilities. In 1985 we received funds to build a science and engineering center; in 1988, to build a physics and biology research center; and in 1991, Congress appropriated funds to build the Center for Photonics Research.

Each of these has been a superb investment for the American taxpayer. Congress allocated $19 million for the first project, $8.5 million for the second, and $29 million for the third, for a total of $56.5 million. Boston University added $81 million of its own investment to the first, $35.1 million to the second, and is contributing $40 million to the third, for a total of $156.1 million.

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[3] The Experimental Program to Stimulate Competitive Research still exists. The others were phased out in the 1970s.

[4] According to the Office of management and Budget estimate, of the $71.073 billion the U.S. Government will spend on research and development in FY 1994, only $2.08 billion will be spent on research facilities. The OMB estimate of the 1994 federal budget for research and development is lower than others. The National Science Foundation estimate is $72.866 billion, (Federal R&D Funding By Budget Function, 1993). An independent source estimates "close to $76 billion," (Jeffrey L. Fox, "Federal Budget: Research and Development Programs," Chemistry and Industry, No. 9. May 3, 1993. p. 308).

For every dollar the government allocated to these projects, Boston University has contributed an additional $2.76—almost a three-to-one match.

The results of the first two projects, begun a decade ago, fully justify the confidence Congress has continued to show in Boston University. In 1985, for example, before Boston University had built the facilities for which we received these appropriations, our College of Engineering received only $1,420,000 in competitive grant and contract awards. Two years later, the College of Engineering won $2.2 million in competitive awards, and since then the figure has grown each year. In 1994, it reached $9.2 million, an increase of 647 percent in less than ten years in the amount of research—funded through the open, competitive, peer-reviewed process—that our College of Engineering contributes to the nation.

Boston University, from being a negligible presence in this arena, has become a highly regarded and fast-advancing newcomer in the competition for peer-reviewed awards. We could not have done that without the facility, and we could not have built the facility without Congressional help.

What I measured in dollars can be measured even more persuasively in faculty appointments. By creating the facilities that could support their research, Boston University was able to attract faculty members to the College of Engineering, such as National Academy of Science member Charles Cantor, and top ranked researchers such as Allan Pierce in aerospace and mechanical engineering and Charles DeLisi, one of the founders of the Human Genome Project. The reason that Boston University suddenly began winning large competitive awards after years in the minor leagues was that we signed over forty new faculty members in engineering, some of whom are senior scientists at the top of their profession, and the rest of whom are those senior scholars' hand-picked choices among the best new researchers in their fields. A glance at the list of faculty we have appointed in the last ten years easily explains why the American Association of Universities fears the effects of earmarking. Earmarking is the ante that gives places like Boston University a seat at the table, and the last thing those institutions want is an aggressive new player in their game.

The effects of the two older grants I mentioned—the $19 million award received in 1985 and the $8.5 million award in 1988—went far beyond our College of Engineering. In biology we went from annual peer-reviewed awards of about $2.7 million in the mid-1980s to almost $5 million last year. And in physics, we climbed from $1.1 million in 1985 to over $7 million in 1993. With the collapse of the Superconducting Supercollider project, last year that figure fell to $5 million, but we retain the more important asset: a physics faculty that is now ranked in the top six in the nation for the quality and influence of their research publications. Professor Lawrence Sulak leads a group of scientific stars, none of whom would be at Boston University were it not for the state-of-the-art facilities that Boston University built for physics research in the 1980s. Since building the facilities, the University has added in physics 20 new faculty positions and 30 new post-doctoral positions. The Physics Department now has 60 graduate students enrolled in the doctoral program, compared to a mere handful before this expansion began.

Educating Scientists and Engineers for the Next Generation

Faculty members such as Professors Cantor and Sulak raise a university's ability to compete for research grants and they help a university recruit strong junior faculty, but they do one thing that is even more important. They attract superbly-qualified students. Thanks in part to the support Boston University has received from Congress in the past, we have been able to increase significantly the contribution we make to the education of the next generation of American scientists and engineers—upon whom our future economic competitiveness and national security depend.

In the decade since Boston University began building new facilities for research in engineering, physics, and biology, the University has become a serious national competitor for the best undergraduate and graduate students in these fields. Boston University granted fifteen students Ph.D.s in physics in 1993, among them Greg Huber who joined the Lawrence Berkeley Laboratory, Sharon Glotzer who became a research scientist at the National Institute of Standards and Technology, and five who received post-doctoral appointments at major universities. In 1994, nineteen students received Ph.D.s in physics at Boston University and went on to teach and do research at M.I.T., Harvard, the University of Chicago, and the Los Alamos National

Laboratory, among other places where their advanced skills could be applied. Stuart Berkowitz, who received his Ph.D. in January, focused on high temperature superconductivity and is now a staff scientist at the most successful and rapidly expanding domestic superconductor company, Conductus, in Mountainview, California. His classmate Anna Swan won the prestigious Wigner Fellowship at Oak Ridge National Laboratory where she is in the rare position of having been appointed staff scientist without the usual post-doctoral training.

Our undergraduate physics majors likewise have an outstanding record. Among the students who graduated from the program this year, four are already enrolled in Ph.D. programs in the sciences. Seven of the 1993 graduates are pursuing Ph.D.s in physics or related fields.

Economic Benefits to the Community, the Region and the Nation

The benefits of these grants extend beyond the promotion of important new scientific research, beyond the gathering together of scientists at the top of their disciplines, and beyond the creation of first-rate educational opportunities. These two grants also brought important economic benefits to the local community and to the surrounding region. The erection of three large buildings created good construction jobs and revitalized a run-down section of the City of Boston. When the buildings came on-line, Boston University was able to create more than 100 new positions—73 in physics alone—many of which were the sort of high-paying technical jobs that have the largest benefits for the wider economy.

For example, the Science and Technology Center includes four specialized scientific shops: a Scientific Instruments Facility, an Electronics Design Facility, a Physics and Engineering facility, and a Materials Research Facility. Together, these facilities build the specialized instrumentation needed by Boston University scientists. These facilities have enabled us to recruit the best scientific technicians and machinists in the world, and they are so good at what they do that these shops have become the fabricator of state-of-the-art high-tech machinery for academic and business clients across the country. A partial list of their clients includes the Oak Ridge National Laboratory, Brookhaven National Laboratory, Fermi Lab, the Supercollider Center, the Stanford Linear Accelerator Center, both National Magnet

Laboratories, NASA, the Space Telescope Institute, the National Science Foundation's South Pole Astronomical Center, Draper Laboratories, AT&T Bell Labs, Harvard University, M.I.T., the University of Maryland, the University of Michigan, the University of Chicago, the University of Utah, Stanford University, Colorado State University, the University of Pennsylvania, SUNY Stony Brook, and the University of California at Berkeley. I cite these clients in part to show the national scope of the contributions made by just this one component of the Science and Engineering Center, a component which employs 23 highly-trained individuals who have become, by themselves, an important asset in the New England economy.

Boston University did not receive final approval of the photonics grant from the Department of Defense until last year, and the new photonics facility has not yet been built. It is therefore premature to look for results comparable to those that have come from the earlier grants. I do observe, however, that the photonics award has brought to Boston University its first-ever National Academy of Engineering member, Dr. Donald Fraser, whom we recruited to direct the Photonics Center. And Dr. Fraser has already begun to assemble researchers from around the country who will make the Center for Photonics Research a formidable competitor for peer-reviewed federal grants in photonics.

"Earmarking" Does Not Undermine Peer Review

For those who believe that Congressional appropriations for specific projects are "the earmarked slaves of Satan," this record of leveraging federal grants to build a new and highly successful base for advanced scientific research may not matter. I do not suppose that rational argument will convert those who oppose earmarking as wrong, regardless of what the funds are used for and what benefits they bring. I do hope, however, to persuade those who are willing to judge on their merits the arguments for and against appropriations for particular universities.

In that light, I would like to address the principal argument that has been raised against earmarking as a way of allocating funds for scientific research: that it undercuts peer review of research proposals. The three grants Boston University received to build its infrastructure have not, in fact, undercut this process. To the contrary, they have enabled Boston University to join the ranks of research universities that can compete effectively for federally-sponsored peer-reviewed research grants. We can compete effectively because we are now able to attract faculty members of the caliber to submit competitive proposals, and we have been able to attract those faculty members because we have the facilities they need for their research.

Competition is strengthened by the addition of qualified competitors. It is understandable that those who benefit from oligopolies, whether they be baseball owners, telecommunications companies, cable television vendors, or wealthy research universities, do not welcome new players. Under the guise of concern for the purity of the old rules, they argue for steps that are really aimed at maintaining the status quo, in which they enjoy the lion's share of the benefits.

I will have more to say about this later, but first I would like to answer directly one of the Committee's questions.

Question 1. Why Boston University seeks earmarked funds.

I assume that the Committee raised this question in connection with the $29 million grant Boston University received to build the Center for Photonics Research.

Why Should the Congress Care About Photonics?

Photonics, which is the use of light for practical purposes, is already a major industry in the United States. Lasers are used in surgery, in every photocopier, laser printer, and supermarket scanner in the country. The compact disc, which has revolutionized data storage in the music and publishing industries, is a photonic device. The optical fibers used in communications are also a photonic technology. In 1993, photonics was a $75 billion industry—and it is an industry that is still in its infancy. It is expected at the least to triple in size in the next ten years, and to grow tenfold in the next twenty years. The photonics industry today is at the point the electronics industry was in the 1950s.

All of the basic components of photonic technology were invented and developed in the United States. You will look in vain, however, for any large-scale programs sponsored by the United States government to encourage American universities and American companies to push this technology further or to harvest its benefits. In both areas, Japan and Germany have mounted major initiatives, while the United States has confined itself mostly to small-scale opto-electronics research and some weapons development.

The principal reason Boston University sought earmarked funds for our Center for Photonics Research is that the Center is something the country needs, but for which there is no other kind of funding. The Center offers an opportunity for the United States to leap ahead in an area of technology of vital interest to both the military and to the civilian economy.

Why Ask Congress?

The normal process the government uses to develop programs, shape their administrative rules, solicit proposals and oversee competition offered no appropriate avenues. We sought to identify relevant funding opportunities for three years before we began any effort to convince Congress to earmark funds for this project. There simply were no programs that allowed for a project of the kind we envisioned.

One alternative would have been to try to persuade an agency to establish a new program under which the proposal for the Center for Photonics Research could have competed against other such proposals for funding. This was not a practical choice for us. The process of establishing broad new programs is too slow. Some scientific advances, military applications, and new industries cannot wait for years on end. The research establishments in other countries seize the potential of new research and new technology before the slow gears of the normal cycle of Congressional approval, agency development, proposal preparation, and bureaucratic review have turned their first revolution.

Congress has in fact recognized and responded to this problem. It has understood that the system established to allocate federal support year-by-year to existing laboratories is not the best way to accommodate new ideas quickly. Sometimes those ideas require building new infrastructure, and infrastructure proposals do not fit the model that contracting officers and agencies use for technical programs. Moreover, proposals that deal with the frontiers of scientific progress are often multidisciplinary and involve multiple government agencies. In such circumstances, the only practical option is for Congress to enact special legislation.

Despite frequent charges of "gridlock," Congress can and in many cases does act quickly and effectively in addressing problems that either were not foreseen when the agencies administering scientific funding received their mandates, or that require an expeditiousness which the agencies do not have. Earmarking funds is a way of slicing through the Gordian knots with which the federal bureaucracy is often bound.

Boston University and its partners in the New England area have much to offer in making our country a dominant force in photonics. A new way of doing research and development has to be developed, a way that enables products to move more quickly into the defense establishment and the marketplace. The normal process, in which one casts about to find a government agency that has an appropriate program, and then goes through what is often at least a one-year competitive cycle for a small grant with limited objectives, is not the way to enable the U. S. to vault ahead of its international competitors.

We discussed this problem with members of our delegation in Congress, who agreed that keeping the United States in the lead for this critical technology required a special approach to research and development. Senator Kennedy, who has long recognized the importance of technology in our economy, introduced language which resulted in a grant to Boston University from the Department of Defense to establish the Center for Photonics Research.

The purpose of this Center is to accelerate the exploitation of photonics technology for defense and commercial applications and to assist our domestic photonics industry to become more competitive in the international marketplace. The Center for Photonics Research is crucially important not only to the University but to our city, our state, and most importantly, our nation.

Boston University pledged in its proposal for the Center for Research in Photonics to invest $16 million of its own funds for the construction of a state-of-the-art facility. As I mentioned, we are now planning, on our own initiative, to invest more than twice that—$40 million—because we believe that to do so will be a wise use of our resources. We will also carry up to one-third of the annual $4 million operating expenses of the Center in the first three years, and will fully support its operations thereafter. These investments of private sector funds, building on the start-up funds provided by the Congress, are essential to attract new faculty, assure the development of prototypes of new devices, incubate new businesses, and foster business relationships outside the scope of the federal grant.

Petitioning Congress Is a Constitutional Right

Thus far I have answered the question, "Why did Boston University seek earmarked funds?" somewhat defensively, as if seeking earmarked funds may be necessary but not really desirable. Indeed, had there been a more effective method for funding this important venture, we would have employed it. There is, however, a broader and perhaps more important answer to the Committee's question. Boston University sought earmarked funds not just because it was a practical way to fund an important project but also because it was the right way to approach the instruments of American government.

The Constitution ensures all citizens the right to petition the government. Congress is elected precisely to make judgments on what constitutes the national interest. In far too many areas, that Congressional responsibility, fundamental to our representative democracy, is usurped by unelected bureaucrats who assume that their narrowly-focused judgments are adequate to determine national policy. Going around the federal bureaucracy is not something any American should be ashamed of. In fact, Americans have a great deal of common sense about this. They know that if they want to conduct routine business, they can usually rely on the federal bureaucracy to help—sooner or later. But Americans also know that if their business is not routine, the federal bureaucracy will almost certainly be an obstacle. Their only real chance for timely action is to ask for help from their elected representatives.

The agencies that administer funds for scientific research and development are no exception to this rule. When asked to fund a crucially important new project, they are paralyzed in the face of demands to support existing research centers. They have virtually nothing in their budgets for basic infrastructure. Their programs to support the acquisition of some kinds of instrumentation, and their programs to support education simply assume that colleges and universities will have the specialized—and expensive—facilities in which the research will be carried out, the instruments installed, and the students educated.

The Limits and Limitations of Peer Review

It is true that there are a handful of universities in the United States wealthy enough to absorb the costs of building their own scientific infrastructure. These are the same universities that dominate the peer-review process and that, along with the federal bureaucrats with whom they work hand-in-glove, ensure that the research base remains limited to the same institutions that have received the largest share of federal support for the last fifty years.

Indeed, virtually all—and certainly the most strident—of the objections that have been raised against federal appropriations for new science facilities rest upon an argument that is redolent of the self-interest of this small, privileged group of well-heeled universities. They claim that by providing relatively small amounts of aid to renew the nation's obsolete and obsolescent scientific infrastructure, the Congress is somehow undermining the system of "peer review."[5]

This argument is false on its face. First, it ignores the fact that funds to build the facilities in which scientists work have, with few exceptions, never been subject to the traditional peer review that is applied to proposals from individual investigators for basic research grants. Moreover, the seven universities that received non-peer reviewed federal funding to establish major laboratories after World War Two now receive over $2 billion annually in direct appropriations for their affiliated laboratories—without any peer review. All seven are among the top twenty recipients of federal research funding.

This only begins to suggest the amount of straw that has gone into the construction of this scarecrow, the alleged threat to the system of peer review. Peer review turns out on closer inspection to cover only a small part of federal research funding, including the funding received by the handful of universities who are worried by the spread of earmarking. The peer review system does not, for example, apply to any of the 19 Federally Funded Research and Development Centers, which are typically owned by the federal government and operated by host universities under contract arrangements with the sponsoring federal agency. Funds for these federal laboratories, which have amounted to more than $6.3 billion in each of the past three years, appear as a series of line items in the federal budget and are not subject to peer review.

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[5] This Committee's published estimate of the total amount spent on academic earmarks in fiscal 1992 is $708 million. For comparison, the total of federal-agency sponsored research at universities in 1991 was $11.8 billion. Academic earmarks thus, by the Committee's own figures, total less than six percent of the amount officially allocated for science and engineering research through the agency system.

Nor does the peer review system apply to most of the research funds distributed by the U.S. Department of Agriculture. Most USDA research funds are distributed to state land-grant colleges and universities by means of ~~formulas that do not~~ consider the academic quality of the research but rely rather on the relative size of the rural and farm populations in the states where these institutions are located. Under the budget which President Clinton submitted for FY 94, the Department of Agriculture would fund nearly $1.44 billion in research, approximately half of which will be conducted at universities. Only $33 million, or about 2.3%, is subject to peer review.

In fact, the peer review system, which uses panels of outside evaluators to rank competing proposals for limited research funds on the basis of merit, operates mainly in the National Science Foundation and the National Institutes of Health. A somewhat similar system is also in place for nuclear and high-energy physics research funded by the Department of Energy. This, of course, is entirely proper. These agencies and programs are primarily designed to provide grants to individual investigators to support basic research. Their purpose and organization are thus better suited to the use of external advisory panels to comment on applications from university-based researchers than are mission-oriented agencies like NASA, the Department of Defense, and even the Department of Agriculture.

Because federal support of science and technology is spread over so many agencies and because the mechanisms for providing that support are so various, it is difficult to determine precisely how much federally-sponsored scientific research is actually subject to peer review. One might assume that the upper limit of the amount which the federal government distributes through peer review to universities is $11.8 billion, because that is the total distributed to universities for research which comes through the federal science agencies. But the actual amount which goes through peer review is much smaller, because the $11.8 billion includes all of the non-peer reviewed grants to laboratories such as Fermi Lab, the Lincoln Laboratories, the Jet Propulsion Laboratory, and many other non-peer reviewed programs.[6] A conservative estimate, however, would be that, under President Clinton's FY 1994 budget, no more than $6 billion out of approximately $76 billion, or less than eight cents of every federal dollar spent on science and technology, will fall under the peer review system. And almost all of the research support that is awarded through peer review comes to university faculty members and is carried on in laboratories and other facilities located on university campuses.

Who Complains About Congressional Support and Why?

When Congress spends funds to establish additional centers or to upgrade the quality of existing centers, it increases the number and quality of places in which work is done that falls under the peer review system. By increasing the university-based facilities in which high quality scientific research can be performed, Congress thereby increases the scope of the peer review system. New facilities built with federal funds, far from diminishing the effectiveness of the peer review system, actually increase its quality and effectiveness.

This should be an occasion for rejoicing within the scientific community. Yet, as we have seen, a few scientists, as well as some members of the federal scientific bureaucracy and some major research universities, are not rejoicing. Why? To understand this apparently mysterious phenomenon, it is necessary to pierce the veil of self-serving rhetoric that surrounds the peer review system. No one would deny that the principle of peer review is commendable when it is applied in the appropriate way to appropriate programs. In practice, however, the system of peer review now in operation in this country is seriously flawed. According to National Science Foundation figures, 31 institutions, clustered in just three geographic regions, receive over half of all federal research support. In FY 1991 (which is the most recent for which there is published data), 20 institutions received approximately 36% of the total awarded to all 592 research universities receiving federal research and development support. In fact, the top 10 institutions receiving support from the NSF received 25% of all NSF funds, and the top 20 institutions received 46% of all NSF funds. The National Institutes of Health funding is reported through the Department of Health and Human Services. The top 8 recipients of HHS support in 1991 received 22% of all that agency's research funds and the top 15 institutions received 36% of HHS research funds.[7] This is a picture of a highly concentrated pattern of federal support.

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[6] The total in non-peer reviewed grants to federally funded research and development centers at universities in 1993 was $3.7 billion. National Science Foundation. Survey of Federal Funds for Research and Development: Fiscal years 1991, 1992, and 1993. Table C-12.

The peer review system, instead of realizing the intent of Congress to broaden the institutional and geographic base of scientific research in this country, has worked to create a tightly-knit old-boy network. In the National Science Foundation Act of 1950 (P.L. 81-507; 42 USC 1861), Congress explicitly directs that "it shall be an objective of the Foundation to strengthen research and education in the sciences, including independent research by individuals, **throughout the United States, and to avoid undue concentration** of such research and education" [emphasis added]. Yet in practice, the NSF and the system of peer review have produced precisely the undue concentration of scientific research and education that the Congress has been concerned to avoid.

It is worth describing briefly how the present situation came about. In the beginning, there were a few institutions that were able to provide outstanding facilities for scientific research on their own, either through endowment funds or through liberal access to state tax dollars. Obviously, such facilities attract outstanding research scientists and outstanding students who together produce outstanding scientific work. This is the reason that academically strong institutions lacking the endowment funds or state largesse to build equivalent facilities have sought assistance from the Congress. These institutions have demonstrated their ability to contribute to the national effort in scientific research, and they properly resent being shut out by those who got to the trough first. The nation would also suffer from their exclusion, had not Congress wisely decided to support their development.

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[7] National Science Foundation, Federal Support to Universities, Colleges, and Nonprofit Institutions: Fiscal Year 1991. Table B-7, "Federal obligations for academic science and engineering to the 100 universities and colleges receiving the largest amounts, ranked by total amount received, by agency: fiscal year 1991."

But those institutions that were first to establish their excellence have shortsightedly decided to try to restrict membership in the scientific establishment to themselves. There are several ways they have tried to keep others out. Ignoring both the history of large-scale non-peer-reviewed government investment in their own facilities and the large on-going non-peer-reviewed subsidies for their laboratories, these institutions disingenuously argue that earmarked grants to other universities are undermining both the peer-review process and the meritocracy that process is supposed to sustain.

The truth is that direct federal investment in infrastructure does not undermine the peer review system or the principle of meritocracy. Both forms of funding are necessary: the first primarily to create plant and equipment, the second primarily to pay for operational expenses. The former establishes centers in which individual scientists do their research; the latter supports these individuals according to their individual merits. The actual accounting is, of course, more complex, but the principle is clear. The argument against earmarking as a danger to peer review is merely an attempt to obscure the fact that the two forms of funding support separate and complementary phases of advanced research.

It is no wonder that the big players among universities in the competition for federal research funding prefer to focus on the alleged dangers to the peer review system. They virtually own that system. Because they already have distinguished investigators on their faculties, federal support, allocated through the peer-review process, naturally concentrates in their laboratories. In addition, many scientists who are invited to serve a term as project officers within the granting agencies come from the same universities. The consequence is that rich and well-established universities and their distinguished faculty—both on campus and in the agencies—become judges in their own cases.

In these circumstances, it is hardly surprising that the rich get richer—or that the disadvantaged seek relief from the Congress. The Congress was created in part to prevent such exclusionary practices. For despite the intentions of Congress, federal policies towards scientific research have operated to create in effect two castes of research universities, and it is not merely appropriate but in conformity with national goals established by Congress for the "have-not" institutions to seek federal support to redress the imbalance that currently exists.

Sauce for the Goose

Nor should anyone be surprised by the strong defensive reaction of the "have" institutions to the initiatives of the "have nots." As we have seen, the "haves" constitute an informal cartel, and they behave much like classical economic cartels, such as OPEC. Like OPEC, it is in the interest of the members of this academic cartel to preserve the status quo, because it confers so many benefits upon them. In consequence, they have reacted violently to the appearance of a mechanism—direct Congressional funding—which if it were to become widespread would threaten to break the cartel by placing other institutions in a position to compete on an equal or nearly equal footing for the limited federal research funds dispensed by peer review. Those institutions seeking direct Congressional assistance are by no means trying to avoid peer review in the area in which it has traditionally operated—basic research—but only to achieve the critical mass of facilities and personnel necessary to compete for peer-reviewed grants.

Moreover, the "haves" have adopted a strategy that has the same effect as direct Congressional funding, but because it is less visible to the public has not generally been recognized for what it is. In some cases—the establishment of the national supercomputing centers in the mid 1980s is a good example—they have actively lobbied for legislation that would fund specific new programs in the budgets of federal agencies, and have informed the agencies of their efforts. When the bills pass and the new programs are established, the universities have then applied for grants from the new funds. By a strange coincidence, the grants have been forthcoming. The difference between this practice and the practice of directly approaching Congress for funds for specific projects is difficult to determine. It seems obvious that, for the academic cartel, what is sauce for the goose is definitely not sauce for the gander.

There is another theme sometimes sounded by the defenders of the old order. Joe Wyatt, the Chancellor of Vanderbilt University, testified before this Committee in June 1993 that the United States faces a crisis because it is "yielding control of its research budget to special interests." Yet in 1986 Vanderbilt had no qualms about seeking and accepting in its own "special interest" a $100 million exemption from the Congressional cap on the amount of tax-exempt bonds an institution may issue.[8] Relief from the tax-exempt debt ceiling may of course serve the public good if the universities which receive such special help make use of the opportunity to invest in facilities for important kinds of research. I do not object in principle to this kind of assistance to higher education, but whatever the merits of the special interest assistance to Vanderbilt University, I submit that Congressional appropriations for projects such as the Boston University Science and Engineering Center, which grow out of specific proposals argued before Congressional committees and which produce far-reaching and well-documented scientific, educational, and economic benefits, are of far more obvious benefit to the national interest.

Chancellor Wyatt's remarks were disingenuous in yet another way: there is, of course, no such thing as a unified federal research budget. The expenses that support research are spread over many categories, and there is no budget at all for creating new research facilities. Chancellor Wyatt's fears about the government "yielding control" of that budget are, therefore, misplaced, indeed imaginary. Congress is in firm control of the allocations and can usually distinguish between proposals that serve only a special interest and those that serve the broader public interest.

The cluster of factors I have described—the inflexibility and overextension of the granting agencies, the lack of support for new infrastructure, the ingrown peer review system, the domination of a small number of research universities, and the attempt by some to conjure up a scary image of research dollars being spent frivolously at the expense of serious science—is a formula for inertia and national failure. The current system of federal funding for scientific research and development cannot address important needs, such as the need to expand infrastructure and to move quickly in areas of rapid transition between scientific advances and technological applications. In this circumstance, the rational and the right thing for Americans to do is to ask their elected representatives for help. That is why Boston University has sought earmarked funds.

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[8] "Shunning Earmarks, Vanderbilt Got Tax favors," Science & Government Report. Vol. XXIII, No. 19, December 1, 1993.

I should repeat that earmarking is nothing new. It has existed since the first Congress, and it has become among the most common ways to fund public works projects in the United States. In recent years, members of Congress have begun to add language to legislation of all types to fund research and development projects in their districts. In doing so, the Congress has merely extended one of the tools of good and responsive government to an area where a new approach was sorely needed.

Before I proceed to the Committee's second question, concerning the benefits of the funding Boston University has received, I would like to take up the Committee's third question, which I believe is more central to the broad issue of the legitimacy of Congressional earmarking.

Question 3. How the project relates to the funding agency's mission, as well as national goals and priorities.

In order to obtain the grant which established our Center for Photonics Research, Boston University prepared a comprehensive proposal. This proposal was reviewed by Department of Defense officials and was revised in ways they suggested. The version of the proposal which finally evolved from this process enumerates how the work serves the mission of the funding agency, the Department of Defense.

The Boston University Photonics Center and the National Defense

The following is an excerpt from the proposal to create the Center for Photonics Research which provides a summary of how the Center will contribute to the national defense:

> Photonics in the 1992 Defense Technology Plan
>
> Photonics will be critical to successful defense missions, as budget constraints and the changing geopolitical scene demand more efficient and effective fighting forces. Air, sea, land, and space platforms and systems will need faster, lighter and more effective communications, faster computer processing, and novel sensing, recognition, and engagement capabilities. The well-documented potential contributions of photonics were illustrated in the seven major priority areas of the DoD July 1992 Defense Technology Plan. Major challenges in photonics research were associated with the key

technological areas involving computers, sensors, electronic devices, environmental effects, and materials and processes. Many specific defense problems are tightly coupled across key technological sectors, so that photonics research pursued simultaneously on several fronts will have maximum impact. For example, improved opto-electronic integrated circuits (OEICs) will support faster optical communications. Advances in photonics will also foster communications over new high-capacity networks and between databases. The potential for breakthroughs is so great in such a setting that calls for institutional structures that facilitate collaborative interactions must be a high funding priority. The 1992 Defense Technology Plan recognizes the strength and efficiency of collaborative research including the establishment of centers of excellence related to photonics. A strong domestic photonics industry serves both defense and civilian applications. Besides strengthening our national competitiveness, civilian photonics activity creates the resources for serving future DoD requirements.

Four Core Problems form the initial technical focus for the Center: fabrication of novel photonic devices that result in semiconductor lasers, light emitting diodes, and semiconductor detectors at blue or ultraviolet wavelengths; development of spectroscopic techniques for ultra-sensitive detection of pollutants or chemical warfare agents and photocatalytic materials for pollution remediation and detoxification; development of photonic biomolecular materials with unique properties for chemical sensing; and design of ultra-high-capacity super computer networking and storage technology.

Core Problem 1: Wide Band-gap Semiconductor Materials

The first core problem is identified with the development, characterization and application of wide band-gap semiconductors. Emitting in the blue or ultraviolet spectrum, large band-gap lasers and laser materials can provide many technical benefits, from higher density optical data storage to greater penetration of water for communications or search and track functions like shallow water mine detection. Space-to-space communications also would benefit from emitters and detectors in the 240-280 nm wavelength range.

Since the Earth's atmosphere is opaque to these wavelengths, such communication is secure from surveillance from the Earth.

Also, blue light sources will be critical to improved color displays, especially flat panel displays and the color megapixel displays needed for fast synthetic reality displays that promise to play an important role in mission training and battlefield simulations. Integrated with other tunable sources, wide band-gap sources open new areas for wavelength division multiplexing of high speed communications, increasing greatly the channel bandwidths over optical interconnects and fiber communications systems.

Core Problem 2: Biomolecular Materials

The second core problem addresses the development and characterization of biomolecular materials in photonics applications. A particular focus will be the development of new materials for detection of chemical warfare agents, a key DoD mission goal.

In the last decade, considerable interest has been directed toward the development of biomolecular materials, materials containing native biomolecules such as proteins and nucleic acids or derivatives thereof. It is known that some of these biomolecules exhibit potentially useful properties including selective response to biologically active chemicals and biomolecules. Benefits to the DoD's mission would accrue in these areas; 1) to produce novel materials for sensing of chemical or biological warfare agents; 2) other new photophysical properties of biomolecular materials might be exploited for optical information storage and processing, or for the application of dynamic spectral changes for camouflage or eye protection; 3) at a time when circuit fabrication processes using conventional solid-state, chemical and optical methods are reaching fundamental scale limits, the promise of molecular level manipulation to allow new circuit devices is needed.

Core Problem 3: Environmental Sensing and Photocatalysis

A growing DoD challenge is the control and disposal of hazards associated with both battlefield maneuvers and with peacetime operations and procurement. Of particular urgency is the assessment of the effectiveness of storage of chemical or biological warfare agents. We seek to provide new methodology for the sensing of chemical agents through photonic devices that are ultra-sensitive to chemical structure and provide a means for rapid-response analysis. The need for disposal of chemical and other weaponry represents another application of photonics. Mechanisms for the destruction of pollutants using new materials for surface photocatalysis will be pursued. The dangers associated with stored or leaking fuels and oil spills represent just a few problems that may yield to photocatalytic methods, where the use of conventional light sources can detoxify a potentially hazardous materials site. In the Environmental Sensing and Photocatalysis program, methods will be developed to address DoD's needs for remote sensing, and the mitigation of hazards through photonics methodology.

Core Problem 4: Photonics Links among Supercomputers

In the fourth core problem area, we plan to use photonics technology to interconnect remote supercomputers with ultra-high speed optical data networks which will enable them to work together as units of a very powerful, distributed supercomputing complex. The distribution of supercomputer resources entails many advantages, among which, the most important for the defense effort is improved survivability under attack. However, lack of progress in large scale integration also implies a potential loss of computational power. The primary goal of this project is to develop the technology needed to combine the redundancy and survivability of distributed configuration with the high performance of a closely integrated supercomputer complex. In addition, high-speed distributed data environments for multimedia communications and high-density magneto-optics erasable data storage will also be studied.

How the Photonics Center Will Contribute to Other National Needs

In addition to the above activities focused on the mission of the Department of Defense, the activities sponsored by this grant serve a broader set of national goals and priorities. These fall under the category of national competitiveness and are enabled by the dual-use focus of the grant.

Boston University is already very active in basic research in the photonics technologies and is creating new ideas on a regular basis. Our researchers, for example, have developed a room temperature semiconductor blue light-emitting diode: in short, the basic component for the long-sought blue and ultraviolet lasers. This blue diode is the only device of its kind operating outside Japan. Our researchers have also developed a fiber optic device that identifies the nature and quantity of pollutants in water. Another team is developing a lower-cost gamma-ray camera that will make medical imaging and isolation of radioactive leaks easier.

In each of these projects, the Center for Photonics Research has focused on developing prototypes of working devices so that partner companies can be assured that the technology actually works. For example, fabricating compact disc masters requires a time-consuming manufacturing process that also produced hazardous waste. Our researchers have prototyped a new method for fabricating these masters that cuts the manufacturing time in half and cuts the amount of hazardous waste. The Center for Photonics research is already setting up a company to manufacture these machines.

The purpose of such prototyping is to reduce the time to market for new products, and as the example of the new CD mastering technique shows, we have good reason to think it will succeed.

Prototyping will have some important consequences:

We are increasing the value of investment capital by reducing the risk involved before such money is needed.

By placing our faculty and students on the prototyping teams, we are providing our American photonics industry with the expertise that will enable it to assimilate the technology sooner.

By involving our Manufacturing Engineering Department, we are working out the design and manufacturing issues early so that both the DoD applications and their dual-use commercial counterparts reach the field as early as possible.

By involving our School of Management, we are working early with our partners to identify the best business strategy to exploit these technologies.

By making our facilities and equipment available to our neighbors and partners in the photonics industry, we are creating opportunities for them which they would otherwise not be able to afford. In some cases we are able to provide access to hardware which would be impossible to obtain because it has been invented at Boston University and does not exist elsewhere. In other cases we can expedite product development by speeding up the delivery of specialty parts, which is one of the bottlenecks in the photonics industry.

We are not waiting for someone in industry to read our publications and try to use our ideas by recreating our work in his laboratory, a model which unfortunately is still the typical means of transferring technology from the universities to the marketplace. We are deliberately seeking industry partners and are working on all the practical details, right on our campus, which will make these partners successful in the marketplace, both for the defense needs served by our grant and for the "dual use" commercial derivatives of the same products. The sum of all these activities will have a very important effect: it will make the United States more competitive in the world market and will assure the United States a primary place in the photonics market—which one day, as I said, could become as big as the world electronics market is today.

Question 2. The benefits of these projects to the University's educational and research mission, as well as any related local, state or regional benefits.

Photonics is a critical technology, identified as such by the U.S. Government in the July 1992 Defense Technology Plan. It is particularly important as a dual-use technology with advantages for both the national defense and the economic competitiveness of the United States.

The Center for Photonics Research grew out of the list of strategic priorities announced by the Pentagon in 1992 in its Defense Technology Plan. We developed the proposal which was eventually funded by focusing on a technology (photonics) which the government said is "critical," on a way of developing that technology ("dual use") which the government said it preferred, and on applications of that technology that were calculated to provide the greatest benefit to the regional economy.

A Better Way to Transfer Technology

The Center for Photonics Research at Boston University is developing and commercializing new technologies that will improve America's competitive edge in the global marketplace and at the same time advance education in this country. To accomplish this, the Center brings together, on campus, design, engineering and manufacturing expertise, business know-how, students, and research scientists in an environment where concepts become prototypes, and prototypes become commercial ventures launched through university-industry partnerships as new company start-ups.

The Center represents an innovative approach to bridging the gap between basic research and practical application. Key to the Center's program is close partnership between government, industry, and the university. This partnership allows government and industry to take advantage of the ideas and educational opportunities found in the University. It also exposes faculty and students to the "real world" process of turning concepts that reside in the laboratory into products that thrive in the market and fosters a dynamic relationship that is as innovative as the photonics products it produces.

There are many beneficiaries to this new way of using a major research University. Among them are:

- Students, who gain real, hands-on, interdisciplinary experience as part of their education. They participate in the process of bringing new technology to the marketplace not only with their professors but with professionals from industry. They get to be a member of a team with a serious business purpose and learn from fellow team members whose expertise and training involves many disciplines. The competitive edge of American industry will be substantially enhanced as these young men and women later move into positions of responsibility.
- Parents, who will see their children move quickly and productively into the business and professional worlds because they will graduate with a firm practical understanding of what must be done to bring a product to the marketplace. It is also possible that financial return to the University from successful products will provide a new source of income to assist in controlling the escalation of tuition, a further benefit for hard-pressed American families.
- Companies, who will find new products and markets and gain access to new advanced facilities and experienced faculty to assist in development. This acceleration of new technology to product will enable participating companies to remain more competitive in an

industry where the underlying photonics technology is evolving rapidly and will be the driver to commercial success. For those companies in Massachusetts and other nearby states, the availability of the Center's facilities alone can make the difference between success and failure of a new product. This is particularly true for small businesses which might not be able to afford or have access to such state-of-the-art-equipment.

- Workers, who will have new jobs, both in the short-term because of the construction of a new 250,000 square foot building and in the long-term as the Center for Photonics Research turns to the surrounding urban community to fill technical and support positions. The most important new jobs, however, will result from the creation of new high-tech industries that will arise from the products that the Center will speed to market.
- Our investment and technology partners, who will increase their probability of success in the marketplace because of the risk reduction associated with the Center's prototyping efforts. At the time they choose to invest their time and money they will know that the product works because the first one will have been built and will be working.
- The University also gains and thereby can provide a better service to its students, its community, and its country by increasing its "real world" interaction and experience.
- Our community benefits through an increased business base, new business startups, and the availability of graduates who are well-trained and who can more quickly become productive in the marketplace.
- The Department of Defense, the sponsoring agency, gains by getting the practical benefits of important new technologies sooner. Every prototype developed by the Center under the DoD grant will have a defense application. In many cases the technology not only offers a new capability but offers the potential for substantial operating cost reductions, an important consideration in this era of declining defense budgets.

- The nation benefits by becoming more competitive in the global technological marketplace with new products, stronger businesses, and better trained workers.

There is one more beneficiary. The earmarked funds for the Center for Photonics are enabling Boston University to become highly competitive in several areas of relevant peer-reviewed research competition. Thus, the federal science agencies that need and want strong research proposals to review will have some important new options to consider .

Question 4. The protocol you have developed with the Department of Defense to monitor progress and ensure the quality of earmarked projects.

The protocol we have developed with the Department of Defense to monitor progress consists of activities specified in the grant, the most important of which are the approval of equipment purchases and the establishment of a project file containing justifications for all major subcontracts issued under the grant. We also will be submitting annual technical reports, a final technical report, and a final financial status report.

In addition to the above, in the spirit of fostering communication between our sponsoring agency and the University, we have been active with the DoD in the following other ways not required by the grant:

- providing quarterly technical and program reports
- seeking the advice of the DoD grant monitor on various issues
- visiting the DoD grant monitor to discuss the grant
- coordinating with the Boston Regional Office of the granting agency on various matters
- providing briefings on the Photonics Center and its activities to many DoD, NASA, state, and industrial organizations
- coordinating with the U.S. Environmental Protection Agency and various state and local agencies on matters important to the construction of the Center's new facility to assure both the Department of Defense and the University are in compliance with all federal, state, and local statutes.

Question 5. The reasons that you believe have led to the proliferation of academic earmarking and what procedures need to be established to address this situation.

Mr. Chairman, in your letter inviting me to testify today, you expressed concern over the proliferation of "academic earmarking" and asked my opinion not only as to why it has occurred but what procedures need to be established to address it.

In this testimony, I have provided my considered judgment: I believe earmarking federal funds for academic projects has arisen because it is a way of addressing genuine national needs that the federal bureaucracy is not designed to address. Promoting the development of innovative technologies and the exploration of new frontiers in science is in the national interest, but it requires both an acute understanding of our complex national priorities and leadership. We look to Congress for those qualities, not to specialists in the agencies whose job it is to draw more narrow judgments in their areas of expertise.

In the face of the need to expand the nation's research infrastructure, and to move in a timely manner on some projects of national moment, universities have looked to Congress for help. **I believe that nothing needs to be done about academic earmarking per se, because earmarking is the right way for Congress to address some problems that otherwise wouldn't be addressed at all.** If Congress decided to establish a major program of investment to address the need to renew and extend the nation's research infrastructure, I would applaud the legislation, but that legislation probably wouldn't eliminate the need for some earmarking for academic projects. In at least some cases, it would be Congress that would have to decide the balance of national priorities just as the Founders envisioned when they wrote the Constitution.

Earmarking can be a wholesome and vigorous response to an immediate need. There are other less wholesome uses to which earmarking is sometimes put. I do not speak in favor of all cases of earmarking, but in favor of the principle, which I have shown has worked very much in the public interest in the case of Boston University.

Over the past fifty years, the intellectual geography of American science has been transformed in response to national priorities. There were only a handful of elementary-particle physicists working in the United States before the Second World War. By the late 1970s, largely as a result of this field's importance for our national security, there were nearly 2,000.[9] A similar explosive growth occurred in space science in consequence of our commitment to the space program, a decision made largely on strategic and political grounds. Ninety-six percent of the federal dollars spent to support the 19 Federally Funded Research and Development Centers go to just 10 FFRDCs, concentrated in the areas of weapons research, space research, high-energy particle physics and plasma physics. [10]

We should therefore not allow ourselves to be misled by claims implying that Congress is somehow shattering a time-honored precedent if it invests public monies in scientific research after considering the full range of issues that affect the public interest. The very structure of American science is itself the result of a long and generally consistent series of such investment decisions made by the Congress since the end of World War II. It must be emphasized again that, under our system of government, this is as it should be. In recent years, however, certain sectors of the scientific community, including the Association of American Universities, a quintessential special-interest group, the trade association for a handful of major research universities, have engaged in much public hand-wringing. The pretext for these cries of alarm is not a revolutionary change in Congressional policy towards scientific research. The complaints arise from the prospect of increased competition for peer-reviewed grants as more and more universities develop the infrastructure to support high quality advanced scientific research.

The critics of direct Congressional funding of scientific facilities refuse to deal with the argument that earmarking is the way in which Congress directs the national investment in the infrastructure needed to support scientific and economic development. If they did address that argument, they would be forced to admit that issues of local, regional, and national economic and technological development lie far beyond their competence—and lie directly within the competence of Congress. The location of federally-supported research facilities has an enormous beneficial impact on the economy of the host communities. Not only do such projects have the short-term effect of creating construction jobs, they also have the crucial long-term effect of attracting industries with related interests.

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[9] High Energy Physics Advisory Panel, Report of the 1980 Subpanel on Review and Planning for the U.S. High Energy Physics Program, Washington, U.S. Department of Energy, 1980; cited in Andrew Pickering, Constructing Quarks, Chicago, The University of Chicago Press, 1984.

[10] National Science Foundation, Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Washington, March, 1984, p. 25.

When a project involves significant initial costs, when critical national interests are at stake, and when a host community will be affected economically, socially, or environmentally, then Congress is the only appropriate body to decide how federal tax dollars should best be spent. This is true for projects that focus on economic development—it was Congressional review, not peer review, that established the Tennessee Valley Authority, the hydroelectric projects along the Columbia River, and the massive irrigation projects that in the early years of this century transformed the productive capacity of much of the West. It is true for projects that affect the national defense—it was Congressional review, not peer review, that determined where most military bases and weapons plants would be sited. And it is no less true for major research facilities. **The members of Congress are themselves the only peers qualified to review national priorities.**

In this context, it is clear that universities that approach Congress directly for funds with which to help meet our national need for adequate research facilities are behaving precisely as the framers of the Constitution intended when they guaranteed the right to petition for redress of grievances. Such approaches are among the most effective ways to bring to the attention of Congress the crisis in science facilities that looms on the horizon. Attempts by private organizations and federal science agencies to discourage institutions from approaching Congress directly are presented in the language of upholding standards, but they are really attempts to exert control in an area that has always and appropriately been the province of elected representatives.

Mr. Chairman, I wish to make it clear that, in defending the concept of direct approaches to Congress for facilities funding, I do not wish in any way to denigrate the peer review system when it is properly used to ensure that grant proposals from individual investigators are evaluated by the most competent scientists available. Boston University is hardly an unsuccessful suitor in the peer review process: last year, our faculty received approximately $146 million in competitive, peer-reviewed grants and contracts.

Boston University will continue to compete for those grants, and we will do so with an ever-increasing degree of success, thanks in part to the investment that Congress has made in our facilities such as our engineering, physics, and biology research buildings, and the soon-to-be-built Center for Photonics Research. When we think it is appropriate, however, Boston University will exercise its right to petition Congress for additional help. We will seek earmarked funds when we have the kind of project—in the national interest no less than our own—for which direct Congressional review is necessary.

Congress does not need new procedures to address earmarking. It needs only to weigh such proposals carefully and to make the decisions that are warranted by reasonable deliberation on the costs and probable benefits of each proposal.

Our experience at Boston University demonstrates that Congress has acted reasonably and prudently in approving three significant grants for the development of our research facilities. The benefits to the country from the older two of those grants have been enormous, and the benefits from the third may be even larger. Earmarking in these cases has been good government. I hope Congress will not only continue but, as circumstances warrant, expand the practice.

The CHAIRMAN. May we now go to Sister Mary Reap, the President of Marywood College? And I might make note that Marywood is a largely female student body, that it trains women for rewarding careers, and I want to assure you that it has been our goal here in this committee to bring more women into the field of science and technology research and development, and you are performing a large work there.

Sister MARY REAP.[1] Thank you, sir.

Mr. Chairman, I am Sister Mary Reap, President of Marywood College, and I thank you and the committee for the opportunity to be here this morning.

If I may just note that Marywood is spelled M-a-r-y. In 1993 proceedings of the committee Marywood was referred to on page 94, as M-e-r-r-y-wood. It is a pleasant place but I think our faculty would think it is a bit of a stretch to——

The CHAIRMAN. I think we've corrected that error, Sister Mary.

Sister MARY REAP. Thank you.

Be that as it may, Mr. Chairman, I would begin by saying that when Marywood was awarded a $10 million grant from the Department of Defense an immediate negative impression became very widely spread through the press and the media.

Given the number of institutions that received Federal funding from various sources in that same year, even if we only refer to the amount of earmarked, or so-called earmarked funding in that year, we at Marywood were certainly surprised at being singled out for so much attention.

I won't say that we were sorry to receive all of that national publicity, but at the same time it was somewhat surprising to us given the amount of our award in the context of the total amount given.

Added to that the information provided by a very recent ACE report that suggests that 70 percent of all Federal funding in the same year, about $10 million, was given to 70 institutions out of the 2,100 in this country I think the attention paid to Marywood is even more surprising.

I think it is fair to ask the question, then, from our perspective, of why Marywood received so much attention, and why Marywood was singled out time and again as an example of pork. I can't help but feel that some of the attention was due to a stereotyped perception that pervades this country that a school run by women, religious women at that, could have little, if anything, to contribute to the Department of Defense.

It is, I believe, this same attitude that has led to the sorry state of gender specific research and to the lack of research funding for women researchers in this country that I refer to in more detail in my written testimony.

A few minutes ago Mr. Silber spoke of the great benefit of earmarking in other fields and how we were able to assume as a country a leadership role in those fields. I would suggest that earmarking may be a way to develop the same type of leadership regarding women's issues and family issues in this country, and perhaps will open the doors to the possibility of receiving funding from other sources for this critical need for research in our country.

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[1] Sister Mary Reap has requested changes to her testimony. See Appendix B, Item 5.

My written testimony indicates Marywood's long tradition of concern for women and families. The reputation, the national reputation of our School of Social Work, our prominent role in graduate education—Congressman McDade stated that we are the largest provider of graduate education in northeastern Pennsylvania—have always been the leader in terms of the number of programs and the number of graduate students served.

I would point to our success with an earlier Air Force-sponsored project and propose that all of these indicate that Marywood was a very good match for a military research agenda of national priority that called for attention, immediate attention to issues of military family life.

To those who did know Marywood or who had had the opportunity to work with us, there was no question about our ability to do this research. There was no question about the match of this project and this topic to our long-standing mission and tradition, despite the negative publicity and unfair assumptions.

The Military Family Institute at Marywood is an exciting and needed project that has already begun to make a difference for military families in this country and for this field of research, and has tremendous potential for the future at a national level for issues regarding military family life and American family life in general.

Given the absence of research monies from any source for family and women's issues, and given the great difficulty for most of the 2,100 colleges and universities in this country to receive even peer reviewed funds, we at Marywood felt that earmarked funds were a legitimate source of funding for an area of research that had become a national issue.

However, I would clearly state that we never viewed earmarked funds as an alternative to peer review. And indeed we do not consider earmarking and peer review as mutually exclusive terms, as I describe in my written testimony.

Marywood does support the need for quality control measures regardless of the original source of funding, and I hope that my written statement and the background materials that I provided to the staff assure this committee that Marywood has gone the extra mile to include peer review and quality control at every stage of this project.

Mr. Chair, I made a few suggestions in my testimony of how both processes, earmarking and peer review, might be improved. This morning I would add one more.

Given the number of institutions that are eliminated from the peer review process at the current time, I suggest an additional consideration of partnerships or mentoring between research universities that have traditionally received this type of funding and smaller schools, so that more may have the opportunity to contribute to the research that needs to be done in our country.

Smaller institutions can do quality research, and we are missing their contribution by excluding them from the opportunity to receive the monies that they need to do this work.

The ACE report that I alluded to earlier states that 50 percent of all basic research in our country is done by academic institutions. I think that is a wonderful contribution. But in my opinion, the public trust in the process for investing in the research monies, unless that public trust is restored this critical resource for new knowledge and progress may be lost.

My position is that the source of the funding for academic institutions is far less important than the quality assurances that will earn the public trust and respect.

And finally, Mr. Chair, I hope that like the Little Engine That Could, I have demonstrated that smaller schools can do significant research, that schools run by women can do significant research, that perhaps we can provide for peer reviewed and earmarked funds in a more accountable way, and that the integrity and good name of Marywood College has been restored here today, because the Military Family Institute is a good project of national significance.

And I thank you for the opportunity to explain the Institute to this committee.

The CHAIRMAN. Thank you very much, Sister Mary. I concur in almost everything you said. Small institutions and institutions which focus on females do need greater attention. Your suggestion for partnerships between small and large ones is excellent.

In fact, the kind of research you are doing I would probably even more than Mr. McDade support on a much larger scale, but it is not the most popular kind of research in this country.

[The prepared statement of Sister Mary Reap follows:]

STATEMENT OF SISTER MARY REAP, I.H.M.
PRESIDENT, MARYWOOD COLLEGE

TO

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

September 22, 1994

WHY MARYWOOD SEEKS EARMARKED FUNDS.

Marywood College seeks any and all legitimate sources of funding to support her mission and her agenda. The particular funds from the Department of Defense fit both of these criteria. Marywood, as a college originally founded as the first Catholic College for women in Pennsylvania had grown to be by the 1960s, the largest Catholic College for women in the United States. Thus, the mission and special concern for women and their concerns is woven into the fabric of the College to the present.

Over time, Marywood evolved from a women's college into a comprehensive institution with more than 3,000 students. Today, with two graduate schools, a Graduate School of Social Work and a Graduate School of Arts and Sciences, Marywood is the largest provider of graduate education in northeastern Pennsylvania. Thus, the emphasis on our research agenda has increased considerably within the last 15 years, an agenda which has a focus heavily on families, on women and children, and on issues that affect them.

The importance of gender issues as a research focus has, until very recently, not been a priority or even a topic for funding in most traditional funding agencies.

Examples of this exclusion are provided by many sources. At the federal level, Mary Ruben's analysis "A Declining Federal Commitment to Research About Women", 1980-84, compiles data to demonstrate the reduction of federal money spent on research for women across several agencies. The more recent revelations regarding the absence of gender equity in health related research has been widely documented. And the very recent report of the GAO to the Chair of the Committee on Government Affairs Report (GAO/PEMD-94-1 Peer Review, June 1994) reports gender inequities associated even with peer-reviewed projects.

Within other major funding sources the story is similar. The 1994 figures from the Foundations Center indicate that of the leading 960 foundations, only 5.3 percent of funding in 1992 was specifically tagged for women.

If we add to this the difficulty of smaller colleges like Marywood securing peer-reviewed federal funding at all, you may better understand a desire on the part of many of us for alternative routes for funding. For example, although in 1990 constant dollars federal funding for research rose to $8 billion, 85 percent of these dollars went to 100 research universities with about 50 percent of this total amount going to only 30 universities; other concerns regarding peer-reviewed funding are addressed by the GAO Report and I do not need to list them here since they are readily available.

This is not to say that peer-review is not an appropriate process, despite the need for changes. Marywood College participates in this process and endorses it.

Nor do earmarked funds and the peer-review process need to be mutually exclusive. In the Marywood Family Institute, I believe we have a model that includes the best of all possibilities.

Through earmarked funds we were able to secure funding for an issue that is of national concern, but which had not yet moved into a priority position for traditional funding sources, whether public or private.

But the consistent and constant built in collaboration with the Department of Defense, and their monitoring and input for all research projects has assured a level of quality control and a match to current national issues that cannot be questioned. Indeed, I would respectfully suggest that this Committee may find it to be a model that may shift the emphasis away from the source of funding to an emphasis on assuring the quality and the significance of the research.

I realize that a perception has been created that labels earmarked funds as pork. And I respect the responsibility of this Committee to address that perception. In my view, earmarking can serve a legitimate function, particularly to provide research in areas that are of national concern and yet, not often funded by more traditional sources of funding.

So-called "pork" may not be as much a result of the source of funding as it is the product of non significant research regardless of the source.

And perhaps, a shift to assuring quality control during a funding period may respond to the public's rightful demand that their money be well spent.

BENEFITS OF THESE PROJECTS TO EDUCATION AND RESEARCH MISSION AND ANY RELATED LOCAL, STATE OR REGIONAL BENEFITS.

Graduate education at Marywood evolved over the years. Today, Marywood has two graduate schools: The Graduate School of Arts and Sciences, and the Graduate School of Social Work with a student body of 1,100. Today, Marywood is the largest provider of graduate education in northeastern Pennsylvania.

Marywood's curricular focus on both the graduate and undergraduate levels has always been in the fields of human service. The Mission statement expresses this as:

"Marywood College provides a framework which enables students both to develop fully as persons and to master the professional and leadership skills necessary for meeting human needs on regional and global levels."

Marywood's history chronicles a long commitment to efforts to strengthen women and family life and to address issues related to those concerns. In fact, by the 1950's, Marywood had established a Family Life Institute and had established several initiatives to help married women receive an education.

The Military Family Institute provided many benefits to the College by building on already existing strengths. One significant benefit has been the participation of our full-time faculty in the research projects. To date nine faculty have participated in one of the two projects currently underway. In addition to the research opportunity, these faculty have also been able to work with leading researchers from other universities.

Thirteen graduate students have also participated in the Institute work. The success of the Institute has become nationally known already and Marywood has been encouraged by the military to participate in other national initiatives such as the Defense Women's Health Research Program.

Three nationally recognized researchers have requested to come to Marywood to do research with us and one post-doctoral fellow has been hired. While it is early to evaluate the long-term benefit of some components, we hope that the opportunity provided to so many scholars through this Institute will increase their interest for work in this area and may encourage them to concentrate their research work beyond this Institute to military family issues.

Another regional benefit is provided by geographic proximity to Tobyhanna Army Depot. While Marywood has often provided services to the depot, we have now been requested to provide an analysis of survey data for them.

Among the other benefits the MFI is contributing to the college and to the Department of Defense are: a built-in multi-level peer review process whereby its research agenda is designed, developed, and delivered under the scrutiny of an ad hoc, but soon to be formalized, Scientific Review Panel and the ongoing input from the leading research organizations within the DOD; the opportunity for Marywood to collaborate with scientists from a variety of military commands and research centers on family research projects, thereby ensuring credible research on issues important to the DOD; and a chance to be a part of a national dialogue on family issues with legislative, policy making, and academic leaders through conferences, seminars and symposia sponsored by the MFI.

The long-range benefits to society in general cannot be determined today. However, we do know that the military has often served as a testing ground for the development and implementation of some of the most significant social policies impacting the lives of our citizens. A 1994 publication Women in the Military states "Women's increasing participation in the military parallels trends in the civilian labor market - it is anticipated that women will make up 47.4 percent of the civilian job market in 2005," and that, "The military will likely show similar growth over the next 10 years" (p. 1).

It is the hope of Marywood College to contribute to the quality of life of these women and their families.

HOW THE PROJECT RELATES TO THE FUNDING AGENCY'S MISSION AS WELL AS NATIONAL GOALS AND PRIORITIES.

The MFI Grant proposal identifies the Office of Family Policy, Support and Services (OFP), which is within the Office of the Under Secretary of Defense, Personnel and Readiness, as the primary agency with which it will collaborate in its development. The entire mission of OFP is dedicated to the development of policies and programs addressing military family issues and concerns. DOD dependents education programs, transition support to separating Service members, the DOD Family Advocacy Program (family violence), children and youth services, and a military family information clearinghouse are among the many responsibilities of this office.

The mission of the OFP directly supports the overall mission of the Department of Defense which is to "maintain the peace and to wage war successfully". Although the DOD has not always been as vigorous in its support of its married Service members and their families, over the last three decades it has become increasingly aware of the importance of family support services in the recruitment, retention, and readiness arenas.

Funding for family services and programs has tended to parallel this increasing awareness. It could also be contended that one of the reasons for the enhanced readiness and professionalism of our forces over the past several years has been the support these forces have received for themselves and their families. This support is likely to continue to some degree even in this era of 'downsizing', for as Mr. John M. Deutch, Deputy Secretary of Defense, recently stated, "Given the national security needs we see and which are in front of us every day in the newspapers, we are choosing people, we are choosing quality of life of the troops...". (Washington Post, August 24, 1994)

The mission of the MFI is twofold:

> "To provide the DOD with research results and recommendations which will enable it to better understand, serve and enhance the lives of military families; and,
>
> To develop avenues for the transfer of knowledge between military and civilian communities regarding ways to improve the social, psychological, spiritual and physical health of families"

As stated in our response to your fourth question, we have established a formal process to ensure that the research we conduct addresses the expressed needs of the DOD and the Services and thereby accomplishes the first mission as stated above.

The second of our two mission statements is based upon a conviction that the U.S. Armed Forces have introduced many innovative family policies and programs over the years which may be transferable to civilian communities across our country. In addition, there are other governmental agencies and local communities that have implemented successful family-related programs that the military might adapt to meet its needs. If we can play a role in this transfer of knowledge process, then we will have done much to meet the more encompassing goals of the nation as a whole.

THE PROTOCOL YOU HAVE DEVELOPED WITH THE DEPARTMENT OF DEFENSE TO MONITOR PROGRESS AND ENSURE THE QUALITY OF EARMARKED PROJECTS.

Our response to this question will address two general areas of quality control and accountability: fiscal; and, research design, implementation, and information sharing.

From the fiscal control and accountability standpoint, the Military Family Institute (MFI) has established the following:

1. Internal Controls

    a. The incorporation and integration of the MFI into the fiscal management system of Marywood College has been effected from the outset. This has enabled the MFI program managers to verify and cross reference financial expenditures.

    b. MFI managers track expenditures via Microsoft Excel spreadsheets and charts, thereby enabling them to closely monitor and account for Grant funds on a daily basis.

c. Internal cost analysis and purchasing procedures, consistent with government regulation and Marywood College policy, have been approved and are operational.

d. Monthly department budget reports detailing expenditures are provided by the college's fiscal affairs department as a cross-check to ensure unequivocal financial accountability.

e. Annual review of the MFI's financial practices, in conjunction with the college's annual audit, is provided by the independent accounting firm of Peat Marwick.

2. External Controls

The MFI working in close collaboration with the Grant's fiscal oversight office, the Air Force Office of Scientific Research (AFOSR/PKA), adheres strictly to the requirements, standards and provisions set forth in the Office of Management and Budget (OMB) Circulars A-110 and A-21, and the brochure entitled "Administration of U.S. Air Force Grants and Cooperative Agreements for Basic Research".

As specified in these directives, technical and financial reports are submitted to the AFSOR Administrative Contracting Officer annually. The MFI's first submissions are due in October 1994 (Technical Report) and November 1994 (Fiscal Report).

The MFI has established a cooperative working relationship with its Air Force oversight office. To date, our offices have engaged very effectively in the discussion of a broad range of issues from detailed interpretations of the original grant agreement to technical clarification of the governing directives.

From the research design, implementation and information sharing standpoint, we will address these issues as they pertain to the current MFI research and to projected MFI research.

1. Current Research Projects

The MFI, in close collaboration with the Office of Family Policy, Support and Services (OFP), conceived, designed and is currently implementing two research projects (i.e. Adolescents - a study of attitudes, values and behaviors of military family members; Lifestyle Choices - addresses the impact of military family health/nutrition choices on their children).

OFP has been actively engaged in all phases of the research process, and has provided invaluable help in coordinating design discussions and facilitating cross-Service approval and implementation. The MFI and OFP maintain regular, often daily, contact to ensure issues are being addressed, progress is being made, and the scientific quality of the effort is being maintained.

OFP will receive the data analysis, conclusions and recommendations for all current and future MFI research.

In addition to OFP and Service input into the research design, methodology and instrumentation aspects of MFI quality control, the MFI has engaged the services of a wide range of highly credible consultants (e.g. Dr. Gary Bowen, UNC-Chapel Hill; Dr. Joe Pittman, Auburn; WESTATT) to provide us with an external, independent peer review during all phases of the research process.

2. Future Research Projects

In an effort to underline our commitment to addressing the military family research needs of the DOD and the Services, the MFI will engage in a broad spectrum of DOD policy, and the Services' research communities in the development of its future research agenda.

In addition to OFP, and with their support, the MFI will invite military medical and personnel researchers, along with other OSD-level policy makers, and other military leaders with a vested interest in military family research to the Marywood campus in order to: help define joint-Service family research needs; assist in the development of our research agenda; and, to collaborate with us, as appropriate, in the design and development of the research which follows.

The MFI will continue to utilize the added expertise of external consultants, as stated above, on an as needed basis.

We are also in the process of establishing a Scientific Review Panel comprised of nationally/internationally-known researchers in the social/behavioral sciences, and bio-medical fields. This independent review group, with no vested interest in the outcome of their work, will critique our efforts from conceptualization through conclusion. In an effort to ensure the highest level of participation in this enterprise, we have solicited and received the cooperation of the National Science Foundation and the National Academy of Sciences. It is anticipated that the first meeting of this group will take place prior to the end of this calendar year.

THE REASONS WHICH WE BELIEVE HAVE LED TO PROLIFERATION OF ACADEMIC EARMARKING AND WHAT PROCEDURES NEED TO BE ESTABLISHED TO ADDRESS THIS SITUATION.

From a political perspective I am not well enough informed to speculate on reasons for an increase of earmarking in general beyond what I have already responded to regarding Marywood's participation in this type of funding.

However, perhaps a shift in focus from the process used in securing monies to more focus on the outcomes and value of the research regardless of how it was funded may provide procedures which would better assure the public that the money is being well spent. Marywood's approach may model a move in this direction. While the funding came first, peer-review procedures have been built in for every research project before selection and during implementation. The Military Family Institute addresses a major issue facing our country and we at Marywood are proud of the opportunity to engage in significant research.

I do not believe that anyone today should refer to quality research on women or family life in our country as "pork." And I am grateful to this Committee for the opportunity to provide one perspective on the very important issue of funding for University research.

Assuring the public of the benefit of public monies spent for any purpose is the obligation of all of us and I wish the Committee well in its responsibility toward this end.

The CHAIRMAN. We will now turn to Dr. Covington, Associate Vice President for Research and Sponsored Programs at Sam Houston State University.

Dr. COVINGTON.[1] Mr. Chairman, members of the committee, I am Bill Covington, Associate Vice President for Research and Sponsored Programs at Sam Houston State University. I want to thank you for the opportunity to provide information about the Texas Regional Institute for Environmental Studies which is headquartered at Sam Houston State University.

President Anisman sends his regrets, but he had a scheduling problem and could not attend.

I will try to respond sequentially to your five questions. In order to understand why earmarked funds were sought for the Texas Regional Institute for Environmental Studies, it is necessary to briefly describe the Institute and summarize funding conditions at the time the Institute was founded.

The Texas Regional Institute for Environmental Studies was formed by Sam Houston State University and Stephen F. Austin State University and provides for the inclusion of additional universities and non-university participants. The Institute is designed to bring together a broad spectrum of professional disciplines to address environmental issues.

In this interdisciplinary approach, natural and physical scientists work together with social scientists to understand the complexities of a given environmental issue and how various aspects of that issue affect the world from different perspectives. This interdisciplinary group gathers and interprets data on environmental issues, provides potential solutions for problems, and evaluates solutions with respect to effects of those solutions on matters pertaining to each discipline.

This approach reduces the possibility of implementing a quick solution only to discover that the proposed solution actually exacerbates the problems, transfers effects of the problem to another geographic locality and/or temporarily delays the impact of that problem. With experience, such a program should lead to proactive policies in which environmental problems can be predicted and avoided.

We believe the Texas Regional Institute for Environmental Studies can serve as a model which can be developed, tested, improved and then implemented at additional sites nationwide. In 1989, when funds were initially sought for this program, existing funding agencies were not prepared to fund multidisciplinary and interdisciplinary programs. At that time administrative structures of granting agencies closely paralleled academic disciplines.

Proposals were reviewed within predetermined disciplines. Incoming proposals were routed into a particular discipline, and if the proposal did not match that particular discipline it was rejected. There was little or no opportunity for review and funding of an interdisciplinary or multidisciplinary project.

Although many granting agencies remain structured essentially as they have in the past, an improving environment exists among Federal agencies for funding interdisciplinary programs. Opportunities to develop new ideas from interdisciplinary synergism are fueling the trend toward support of these new interdisciplinary programs.

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[1] Dr. Covington has requested changes to his testimony. See Appendix B, Item 6.

We believe the trend bodes well for the funding agencies, for researchers and for the general public.

Benefits accruing to Sam Houston State University as a result of this funding rest primarily with the opportunity to expand educational and research endeavors. As a comprehensive regional university, Sam Houston State serves approximately 13,000 students from diverse academic and social backgrounds. Support for the Texas Regional Institute for Environmental Studies has provided additional faculty and staff for the university, and while these individuals spend time appropriate to their assignments on Institute research projects, their expertise is also available to educate students.

Many undergraduate and graduate students are directly involved in Institute research projects. Since much of the Institute's research is supportive of the Department of Defense programs, involvement of faculty, staff and opportunity provides direct benefit to DOD.

Local, State and regional benefits of the Institute include expanding the foundation of expertise available to address local environmental issues and providing an economic stimulus to this rural area of east Texas.

As described earlier, the Texas Regional Institute for Environmental Studies takes an interdisciplinary approach to environmental issues with the goal of providing comprehensive solutions to an environmental problem and knowledgeable, proactive policies to avoid future environmental problems.

This approach is compatible with national goals and priorities as well as initiatives by the military services to develop integrated management plans. Most current Institute work consists of developing management plans for military installations. Given current trends, it appears there is national recognition that interdisciplinary, comprehensive planning, with interagency cooperation is much more efficient than each discipline and/or agency working independently and often counterproductively.

Our interdisciplinary program began in an environment where it was one of a few, but is now one of many fledgling interdisciplinary programs, each with its own combination of features and any one of which might provide a model for future approaches to environmental issues.

Funds provided for the Texas Regional Institute for Environmental Studies through the Department of Defense have been used to provide a foundation from which the military can access the expertise residing with the personnel of the Institute.

In addition to the Integrated Management Plan work underway on military installations, a number of other projects have been initiated. Several examples of these types of projects include award of funds from the State of Texas to develop interdisciplinary university environmental education programs and develop curricula to support environmental education programs for primary and secondary schools; development of recovery plans, Endangered Species Act Section 6 research, and completion of status reports in conjunction with the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department; formation of a consortium including private industry and Battelle Pacific Northwest Laboratories and supported by the U.S. Army to address munitions production waste. A pilot plant will be placed at the Radford Army Ammunition Plant.

Participation in informal endangered species consultation with the Texas Department of Transportation, U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department, U.S. Environmental Protection Agency, U.S. Soil Conservation Service, Texas Department of Agriculture, and other agencies to develop protocols to protect endangered species while allowing economic development such as road construction, concern agricultural practices and water treatment construction. This activity is based on proactive approaches involving all interested parties from the beginning, thus lessening the likelihood of protracted battles over these issues.

Further initiatives currently being developed include development of a concept to form an environmental extension network for small businesses. This network would bridge the gap between the U.S. Environmental Protection Agency and small businesses and would function similarly to the pattern between the Agricultural Extension Service and the agricultural industry.

Implementation of a program in environmental law enforcement, assistance to the Texas Department of Health in assessing impacts of environmental issues on public health, development an environmental remediation process and technology transfer site, implementation of an environmental certification program.

The Texas Regional Institute for Environmental Studies operates under a protocol developed by the Department of Defense, Office of the Director of Defense Research and Engineering, to monitor progress and ensure the quality of work completed. Financial and technical oversight rests with the Army Research Office.

Additional technical review is exercised through the Office of the Director of Defense Research and Engineering, Army Environmental Center, military installations where research is in progress, and headquarters and major commands of the Army, Navy and Air Force. Reviews by these agencies and offices ensure that the projects undertaken are of importance to these agencies and that the research protocols are acceptable to them.

Regular reports are made on both fiscal and technical aspects of the program.

And, in conclusion, in response to your request for comments on reasons for proliferation of earmarking, I can only speak for Sam Houston State University, certainly not other institutions. In our case, we had a unique proposal that because of its innovative interdisciplinary nature would not fit into a compartmentalized system of any existing funding mechanism that we were aware of at that time. We believe that current shifts in attitude of funding agencies to a more positive position on interdisciplinary approaches to research will help alleviate this problem.

Thank you for your attention.

The Chairman. Thank you very much, Dr. Covington.

[The prepared statement of Dr. Covington follows:]

Testimony before the House Committee on Science, Space, and Technology
22 September 1994
Dr. Billy C. Covington
Vice President for Research and Sponsored Programs
Sam Houston State University

Mr. Chairman, Members of the Committee, I am Bill Covington, and I want to thank you for the opportunity to provide information about the Texas Regional Institute for Environmental Studies at Sam Houston State University. I will respond sequentially to your five questions.

In order to understand why earmarked funds were sought for the Texas Regional Institute for Environmental Studies, it is necessary to briefly describe the Institute and briefly summarize historical conditions at the time this Institute was founded.

The Texas Regional Institute for Environmental Studies was formed by Sam Houston State University and Stephen F. Austin State University, and provides for the inclusion of additional university and non-university cooperators. The Institute is uniquely designed, bringing together a broad spectrum of professional disciplines to address environmental issues. In this interdisciplinary approach, natural and physical scientists work together with social scientists to understand the complexities of a given environmental issue, and how various aspects of that issue affect the world from perspectives of many of these disciplines. This interdisciplinary group gathers and interprets data on environmental issues, provides potential solutions for problems discovered, and evaluates potential solutions with respect to effects of those potential solutions on matters pertaining to each discipline. This approach maximizes use of resources by reducing the possibility of accepting and implementing a "quick fix," only to discover that the "quick fix" actually exacerbates the problem, transfers effects of the problem to another geographic locality, and/or temporarily delays impacts of that problem. With experience and accumulation of knowledge, such a program should lead to pro-active policies in which environmental problems can be predicted and avoided. As a unique program, the Texas Regional Institute for Environmental Studies was created as a model which could be developed, tested, improved, and the concept implemented at additional sites across the Nation.

In 1990 when funds were initially sought for this program, existing funding agencies were not geared for multidisciplinary or interdisciplinary programs. At that time, administrative structures of granting agencies closely paralleled academic disciplines, and funding proposals were reviewed within disciplines represented in the administrative structure. Incoming proposals were "pigeon-holed" into one discipline. If it did not fit in any existing discipline, the proposal was rejected outright, without review. There typically was no opportunity for review and funding of an interdisciplinary or multidisciplinary project.

Although many granting agencies remain structured essentially as they have in the past, an improving environment exists among federal agencies for funding interdisciplinary programs. Welcome initiatives have come from Congress and the Executive branch in support of federal funding agencies as they move to examine their evaluation and award procedures for research grants. Opportunities to maximize resource use and develop new ideas from interdisciplinary synergism from cross-disciplinary activity, are fueling the trend toward support of interdisciplinary programs, and the trend bodes well for agencies, researchers, and the general public.

Benefits accruing to Sam Houston State University as a result of this funding rest primarily with the opportunity to expand educational and research endeavors. As a comprehensive regional university, SHSU serves students from diverse academic and social backgrounds. Support for the Texas Regional Institute for Environmental Studies has provided additional faculty and staff for the University, and while these individuals spend time appropriate to their assignments on Institute research projects, their expertise is also available to educate students. Many undergraduate and graduate students are directly involved in Institute research projects. Students thus involved receive hands-on training that can be put to good use after leaving SHSU. As Institute research is supportive of DoD programs, involvement of these faculty, staff, and students provides direct benefit to DoD as the projects are completed, and as these individuals learn more through completion of these research projects, they become a more and more valuable resource for the Department.

Local, state, and regional benefits of the Institute include expanding the foundation of expertise available to address environmental issues. Knowledge gained through research activities of the Institute will be applicable not only to military properties where the majority of research is currently done, but will also apply to surrounding areas.

As I described earlier, the Texas Regional Institute for Environmental Studies takes an interdisciplinary approach to environmental issues with the goal of providing comprehensive, fact based, authentic solutions to environmental problems, and knowledgeable pro-active policy to avoid future environmental problems. This approach is compatible with national goals and priorities outlined in recent administration proposals for reinventing government, as well as initiatives by the military services to develop Integrated Management Plans. Most current Institute work consists of developing management plans for military installations. Given current trends, it appears there is national recognition that interdisciplinary, comprehensive planning with interagency cooperation is much more efficient than each discipline and/or agency working independently and often counterproductively. While our interdisciplinary program began in an environment where it was one of only a very few, it is now one of many fledgling interdisciplinary programs, each with its own combination of features, and any one or several of which might provide a model for future approaches to environmental issues in the Nation and World.

Funds provided for the Texas Regional Institute for Environmental Studies through the Department of Defense, have been used to provide a foundation from which the military and general public can access the expertise residing with the personnel of the Institute. Many projects of value to the government have been initiated by using the Congressionally appropriated funding to support researchers at the two universities and make their expertise known and available to government agencies. Several examples of these types of projects include:
(1) Award of funds from the State of Texas to develop interdisciplinary university environmental education programs and develop curricula to support environmental education programs for primary and secondary education.
(2) Development of recovery plans, Endangered Species Act Section 6 research, and completion of status reports in conjunction with the U.S. Fish & Wildlife Service and Texas Parks & Wildlife Department.
(3) Formation of a consortium including private industry and Battelle Pacific Northwest Laboratories and supported by the U.S. Army, to address munitions production wastes. A pilot plant will be placed at Radford Army Ammunition Plant.
(4) Participation in informal endangered species consultation with the Texas Department of Transportation, U.S. Fish & Wildlife Service, Texas Parks & Wildlife Department, U.S. Environmental Protection Agency, U.S. Soil Conservation Service, Texas Department of Agriculture, and other agencies to develop protocols to protect endangered species while allowing economic development (road construction, agricultural practices, water treatment construction, etc.). This activity is based on pro-active approaches, involving all interested parties from the beginning, thus lessening the likelihood of protracted battles over these issues.
(5) Development of a protocol to assist the U.S. Navy to remove nuisance birds from aircraft facilities.

Further initiatives currently being developed include:
(1) Development of a concept to form an environmental extension network for small businesses. This network would bridge the gap between U.S. Environmental Protection Agency and small businesses, and would function similarly to the pattern between the Agricultural Extension Service and agricultural industry.
(2) Implementation of a program in environmental law enforcement.
(3) Assistance to the Texas Department of Health in assessing impacts of environmental issues on public helath.

(4) Development of an environmental remediation process development and technology transfer site.
(5) Implementation of an environmental certification program.

The Texas Regional Institute for Environmental Studies operates under a protocol developed by the DoD Office of the Director of Defense Research and Engineering to monitor progress and ensure the quality of work completed. Financial and technical oversight rests with the Army Research Office. Additional technical review is exercised through the Office of the Director of Defense Research and Engineering, Army Environmental Center, military installations where research is in progress, and headquarters and major commands of the Army, Navy and Air Force. Reviews by these agencies and offices ensure that the projects undertaken are of importance to these agencies, and that the research protocols are acceptable to them. Regular reports are made on both fiscal and technical aspects of the program.

To your request for comments on reasons for proliferation of earmarking, I cannot speak for other institutions as I do not know what their motives might be. In our case, we had a unique proposal that because of its innovative interdisciplinary nature, would not fit into the compartmentalized system of any existing funding mechanism known to us at the time. Current shifts in attitudes of funding agencies--and our society as a whole--to a more positive position on interdisciplinary approaches to research not only addresses this problem, but also strengthens our belief that support for programs such as the Texas Regional Institute for Environmental Studies is taxpayer's funds well spent.

Thank you for your attention and I commend you for your continued support of research and technology.

The CHAIRMAN. Thank you very much, Dr. Covington.

Dr. Beasley.

Dr. BEASLEY. Mr. Chairman, I am Scott Beasley, Dean of the College of Forestry, a student at Boston State University. This statement is presented on behalf of Dr. Dan Angel, President of Stephen F. Austin State University, and in my capacity as Campus Director of the Texas Regional Institute for Environmental Studies, which I will refer to as TRIES.

This statement will address the issues identified in your letter to Dr. Angel, dated September the 2nd, 1994. Stephen F. Austin State University participated with Sam Houston State University as a cosponsor in seeking funding from the U.S. Army Research Office to support the research activities of TRIES.

The purpose of the funding request for TRIES was to provide a cooperative interdisciplinary and integrated approach for solving environmental problems and for managing the natural resources on military bases, installations and reservations.

It is estimated that well over half of the 25½ million acres that comprise these military lands is in relatively undisturbed natural vegetation and serves as habitat for wildlife, including threatened and endangered species. In fact, wildlife is sometimes found thriving on land that have been frequently disturbed by military training.

The Department of Defense has implemented policies and programs that make enhancement of the environment and wildlife a major priority. In 1992, Congress passed the Federal Facility Compliance Act making government polluters subject to the same penalties as private companies. Recent executive orders from President Clinton make Federal facilities subject to many of the same environmental requirements as private facilities.

These recent developments highlight a need for compiling databases on the natural and cultural resources located on military facilities and for developing integrated resource plans for managing the facilities in a manner that is consistent with approved military objectives. The Texas Regional Institute for Environmental Studies is filling this vital role.

In addition to providing an important service to the military, TRIES directly and indirectly promotes the educational and research missions of the university. Education is truly the key to long-term economic growth and societal health, but research is the cornerstone of all future progress.

Therefore, we seek to enhance both teaching and research. Our undergraduate and graduate students benefit both directly and indirectly from TRIES research. Graduate students are awarded stipends that tries to pursue graduate degrees. Undergraduates are employed by TRIES faculty to assist in data collections and analyses.

Participating faculty are revitalized and challenged to contribute new information to their respective fields of study. Students in turn then benefit from the improved knowledge base derived from the research.

Society in general will benefit from an improved understanding of the complex interactions between environmental factors, human activities, including toxic pollution, and the long-term health and viability of plant and animal populations.

TRIES is positioned to fill a vital role in helping the Department of Defense accomplish their mission for managing their natural resources in a responsible manner. In 1991, DOD started the Legacy Resource Management Program to help properly manage its resources. In response, the Army established the U.S. Army environmental strategy into the 21st century.

The Army's environmental quality research and development program is divided into four groups of activities: One, cleaning up contaminated sites; two, complying with all environmental requirements in installation operations, ordnance manufacturing and military field training; and three, conserving, protecting and enhancing environmental, natural and cultural resources using all means consistent with military objectives; and four, preventing future pollution.

The expertise provided by TRIES is especially suited to addressing the conservation, protection and enhancement of environmental, natural and cultural resources. This mission is, in turn, an essential element in the national commitment to conserve, protect and enhance our natural and cultural resources.

An appropriate protocol has been developed between TRIES and the U.S. Army to identify and prioritize research needs, to monitor progress, and to ensure the quality of all projects. We adhere to the U.S. Army's procedures for identifying and prioritizing natural resource conservation and management needs on military installations. And then by working with natural resource personnel on the respective bases and those within the Army's natural resource headquarters, TRIES matches critical environmental needs with appropriate expertise.

Scopes of work are then developed, critically reviewed, and then submitted for approval through the U.S. Army's command structure. All work is carefully monitored by TRIES and the Army to assure adherence to approved protocols.

In response to the question pertaining to the proliferation of earmarking, I simply reaffirm our commitment to doing quality research on issues that are of vital interest to society. Interdisciplinary approaches are used to develop comprehensive databases that will provide the foundation for integrated natural resource management plans on military bases. Society in the broadest sense will benefit from work undertaken by the Texas Regional Institute for Environmental Studies.

Improved stewardship of the environmental, cultural, and natural resources located on military installations will be the result of our efforts.

Thank you for this opportunity to present a statement.

[The prepared statement of Dr. Beasley follows:]

TESTIMONY

PRESENTED TO THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

ON BEHALF OF

STEPHEN F. AUSTIN STATE UNIVERSITY
AND THE
TEXAS REGIONAL INSTITUTE FOR ENVIRONMENTAL STUDIES (TRIES)

BY

DR. R. SCOTT BEASLEY
DEAN, COLLEGE OF FORESTRY
AND
CAMPUS DIRECTOR, TRIES
STEPHEN F. AUSTIN STATE UNIVERSITY

SEPTEMBER 22, 1994

STATEMENT
TO THE
U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE,
AND TECHNOLOGY

I am Scott Beasley, Dean of the College of Forestry at Stephen F. Austin State University. This statement is presented on behalf of Dr. Dan Angel, President of Stephen F. Austin State University, and in my capacity as Campus Director of the Texas Regional Institute for Environmental Studies. This statement will address the issues identified in Chairman Brown's letter to Dr. Angel dated September 2, 1994.

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In addition to providing an important service to the military, TRIES directly and indirectly promotes the educational and research missions of the University. Education is truly the key to long-term economic growth and societal health; but research is the cornerstone of future progress. Therefore, we seek to enhance both teaching and research. Our undergraduate and graduate students benefit, both directly and indirectly, from TRIES research. Graduate students are awarded stipends by TRIES to pursue graduate degrees; undergraduates are employed by TRIES faculty to assist in data collections and analyses. Participating faculty are revitalized and challenged to contribute new information to their respective fields of study. Students, in turn, benefit from the improved knowledge-base derived from research. Society, in general, will benefit from an improved understanding of the complex interactions between environmental factors, human activities (including toxic pollution) and the long-term health and viability of plant and animal populations.

TRIES is positioned to fill a vital role in helping the Department of Defense accomplish their mission of managing their natural resources in a responsible manner. In 1991, DOD started the Legacy Resource Management Program to help properly manage its resources. In response, the Army established the "U.S. Army Environmental Strategy into the 21st Century." The Army's environmental quality research and development program is divided into four groups of activities: 1) cleaning up contaminated sites; 2) complying with all environmental requirements in installation operations, ordnance manufacturing and military field training; 3) conserving, protecting and enhancing environmental, natural and cultural resources using all means consistent with military objectives; and 4) preventing future pollution. The expertise provided by TRIES is especially suited to addressing the conservation, protection and enhancement of environmental, natural and cultural resources. This mission is, in turn, an essential element in the national commitment to conserve, protect and enhance our natural and cultural resources.

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Thank you for this opportunity to present a statement. I will be happy to address any questions you may have.

Thank you very much, Dr. Beasley.

The CHAIRMAN. You know I, in setting the stage for this earlier, indicated that to some degree there is a problem within the Congress itself. Part of that problem is a competition or a rivalry for influence or power.

Under the rules of the House it is a delicate balance between the appropriators and the authorizing committees, who are the vast majority of the House Members, and it is the responsibility of the authorizing committees to screen proposals for research and to ensure that they're the highest priority, and they're fairly and equitably distributed around the country, and that there are processes for quality control.

In the absence of our ability to participate through the authorizing process, we resort to systems like this, interviewing institutions which have received earmarks to see if they meet these standards of equity and high quality and so forth. So, this is part of the result of this somewhat distorted process that we have. We have to go backwards, in other words, and look at some of these.

I do this because I don't want you to think that we are being unreasonable or hypercritical. We may in some cases, if we find that there is a distortion of equity, if there is a lack of quality, we will be critical. If we don't, we will be complimentary, and we have many occasions to be complimentary.

But we still don't like the system, and we're going to ask you to help us correct that system.

I'm going to turn to Mr. Rohrabacher. In view of the fact that he was here first, he deserves the first opportunity.

This is the fun part now.

Mr. ROHRABACHER. I was just—first of all, let me note that again this is not aimed at your individual grants and the things that you have received. Sister Mary, for example, I come from a military family and I fully recognize the importance of the type of research that your institution is engaged in. And I saw the pressures that military families have that other families don't have, and I think it would be very beneficial for the Department of Defense to have the type of study that you were engaged in.

I don't know the details about what you did, but I certainly can appreciate the importance of the subject area. And it seems like your institution may well be—have been the institution that was the best institution for it.

But let's face it. What it comes down to is you have a very aggressive champion here in Congress who was able to get you this grant, rather than going through an authorization process that would be more of a peer review situation.

And that is not to say that your Congressman did anything wrong. As the system is functioning right now, you received a grant because your Congressman did a good job for you. What we are suggesting is perhaps it might be better rather than having it rely on the political abilities of individual Congressman that it might be better to have a systematic approach.

And I'd sort of like your reaction to that, what I just said.

Sister MARY REAP. Yes, thank you. As I stated, certainly Marywood supports, as I think every academic institution would support, a system of peer review, and I think all of us build that into any use of funds or any academic project in one way or another.

I think in theory, to present any project or to present a project in a competitive mode, which is I think the object of peer review, in theory makes sense. In practice, however, is where the difficulty lies for most institutions.

If you consider the difficulty for most institutions to be funded through the current process of peer review, then I think you understand why for many of us who have wonderful projects that need to be done and have another means by which—which is perhaps more flexible and more attuned to some of those areas that we use them if they are legitimate and appropriate to what we want to do.

I think for the peer review process, in my own opinion, to gain merit in the eyes of many of our types of institutions something has to be built in to broaden the number and types of institutions that become eligible for peer review funds and also to broaden, perhaps, the types of topics or areas of research that are even eligible for peer review.

Mr. ROHRABACHER. Let me focus in on this for you. The current system is not peer review, by and large. By and large, what we see are a proliferation of earmarks as the method of actually distributing these funds. Your friend from Boston University thinks that that's actually—in your testimony you are presenting that this is actually the better way of doing things, which I'll ask you about in one moment.

But doesn't that mean for smaller universities like yourself with less political pull, and you just happen to have a Congressman that you know and works with you very well, and has done a good job for you. But doesn't that leave you out—a lot of other institutions like yours out because they don't have the political pull of larger institutions with local political figures?

Sister MARY REAP. That is always a possibility, sir, but we're out of the present system for the most part, so we're used to that.

I think that earmarking, as Mr. Silber suggested, is a very good process for most of us, and has, as you suggest, worked for an institution like Marywood when another process would not have worked for us.

So, I think there are issues involved, whether it is earmarked or whether it is peer reviewed, and depending on what type of institution you are.

Mr. ROHRABACHER. I did notice by your testimony that you did say that peer review and that earmarking are not exclusive, and that you would not think that they are exclusive of each other. However, Dr. Silber was suggesting the opposite and that we should go, from my interpretation of your testimony was that you were suggesting that earmarking actually was the better way to go than peer review.

Dr. SILBER. Yes, I think you're talking about apples and oranges. If you're talking about where to decide to make the investments that will establish the facilities for major new centers of research and new centers of scientific importance, earmarking is an excellent way. If you're talking about how to assign individual research grants to individual scientists, I don't think there is any alternative to peer review.

This is a body of scientists who assess the merits of a scientific project. But there is obviously not going to be any scientific projects coming forward from institutions that have no scientists because they can't get the scientists because they don't have any facilities.

Now, if you take an institution like Harvard with $6 billion endowment, $400,000 endowment per student, I don't see any reason why they can't finance their own research centers.

Mr. ROHRABACHER. If I could play the devil's advocate for you on the point that you are making. That you are then suggesting that individuals competing for peer review is OK, but any larger group or organization or a college it is not OK.

Dr. SILBER. That is right. Because there is no way for the less endowed institutions to ever achieve the facilities that will give them a center of excellence. And the legislation that established the National Science Foundation called for proliferation of these centers of excellence, not their concentration. And yet the NSF as it operates 20 institutions get 36 percent of all the grants out of 592 research universities.

At Boston University we've got an endowment now that is 20 times what it was when I came but it is still only $8,000 per student. When I look at Harvard with $400,000 per student, and I say here we don't mind competing on peer review for individual scientists. But if you are asking can we afford to build the facilities without help, the answer is no.

Now, we've matched the Federal dollars 3 to 1, and we've increased our operating budgets as a consequence of gaining the facilities. But what I'm pleased about is once we had the facilities we could start attracting world-class scientists, members of the National Academy of Science, people who were highly successful in peer review competition.

Mr. ROHRABACHER. I guess, Dr. Silber, what disturbs me about this is really the basis of what you are saying is that a merit-based system on peer review works for individuals, it is not going to work for institutions, but you are assuming then that—let me put it this way. You are assuming that these major institutions are not going to have more political pull with certain—with the politicians that you will.

Dr. SILBER. No. I think that they may, but somehow some of us hungrier institutions work a little harder at it.

Mr. ROHRABACHER. Okay. One last note. You did mention that many of us see smaller amounts of money, and I think you mentioned $20 million or something like that as decimal dust. I want you to know that we do not see it as decimal dust. All of that adds up into one great big deficit that we are facing as a problem.

And one of the reasons why we are here now is because we understand that we have to make the system more efficient, more responsive, and make sure that every dollar that we spend in this institution is going to provide those with the most merit for having that money should be getting it.

Dr. SILBER. Well, if we want to address the problem of the deficit, as long as we're afraid to touch COLAs, we're never going to solve the problem of the deficit. It is not going to be solved by getting rid of earmarking. It'll only be solved when the Congress faces up to the implications of COLAs.

Mr. ROHRABACHER. Or gets out of a lot of the businesses that it shouldn't be involved in in the first place.

Thank you very much, Mr. Chairman.

The CHAIRMAN. Thank you, Mr. Rohrabacher.

Mr. Becerra?

Mr. BECERRA. Thank you, Mr. Chairman.

Let me first begin by thanking and commending the chairman for convening this particular hearing, or this third in a series of hearings. I must say that it is unfortunate that there aren't more chairmen who are willing to actually take us to the meat of issues like this, and I appreciate what he does because I know he doesn't get a lot of pats on the back sometimes for doing this.

Let me also associate myself with the remarks of my colleague from California, Mr. Rohrabacher, when he says that, again, we are here to ask questions but not to place you in an arena where we get to throw the daggers and anything else. That is not the purpose.

It just so happens that your schools were fortunate enough to get some Federal funding for some research, and you happen to be here and, hopefully, providing us with some enlightenment on the whole issue of earmarking. So, I want to thank you for being here.

I want to be a little less gingerly, though, than my colleagues have been, because I think it is an important issue and we have you here and we should make use of the fact that you can provide us some good information, I believe, on this whole issue of earmarking.

I don't believe it is an issue that involves you in any negative way in the whole issue of providing funding for research. I think you happen to be in many ways a symptom of a problem. I think the problem is Congress, Congress and the wielding of influence in a way that allows individual members, not the body as a whole, to dictate where taxpayer dollars will go.

I think a lot of the research that institutions like yours do is essential. There is no doubt. But I suspect that institutions of similar size, similar ability would say that they don't have influential members that can help them obtain those earmarks and as a result they are not benefiting.

Turning to some questions, may I ask each of you to give me an idea of your budgetary process within your institution? How does it work? Do you allocate dollars by your particular schools, your different schools or programs?

And, if each of you can give me just a brief answer on that. Dr. Silber, may be we can begin with you.

Mr. SILBER. Well, first of all, at Boston University we follow the rule that—we reject the notion of every tub on its own bottom where you treat each college as an independent budgetary unit. There is only one bottom at Boston University and that is Boston University.

We know that law school education is inherently inexpensive, and consequently, the surplus that we derive from our legal education is used to fund programs that are inherently expensive such as music, such as theology, such as other courses.

And we know also that a philosophy department can't go out and compete in peer review for NSF grants because there are very few for philosophy. There are very few for history and for English. But we do expect our science faculties and our engineering faculties to go out and contribute revenue to the budget by their competition for peer review research.

Mr. BECERRA. Maybe I can ask for more specificity as each of you answer. Do you have what would amount to a financial sheet where you would have your proposed revenues and your proposed costs written down somewhere, itemized?

Mr. SILBER. Yes. Yes, surely we do. And the President's office in connection with the Provost, we function as an appropriations committee, and although we get recommendations from a wide variety of schools, colleges and departments we make the final decisions, just as the Appropriations Committee does in Congress. Maybe that is one reason why having practiced earmarking at Boston University for so long I don't see the iniquity in it.

Mr. BECERRA. Thank you.

Sister Mary?

Sister MARY REAP. Yes, we too have a centralized system. We do have a proposed revenue and expenditure sheet for the entire institution, and as part of our overall institutional planning process we have several committees throughout the college that make recommendations for expenditures to the Planning Committee, which I chair. And it all goes through my office, but it is one centralized system.

Mr. BECERRA. Thank you.

Dr. Covington?

Dr. COVINGTON. As a State institution, the State has a set pattern, a set guideline that we must follow at the institution. It is all driven by formulas, and there are categories, and we essentially fill in the blanks based on the formulas.

But we do a yearly budget we prepare.

Mr. BECERRA. And it would be written out, itemized as well?

Dr. COVINGTON. Yes.

Mr. BECERRA. Okay. Thank you.

Dr. Beasley?

Dr. BEASLEY. Well, as Dean of the College of Forestry, I only know that I get the same amount of money this year that I got last year, and that is about it. But I'm sure our system is much the same as it is at Sam Houston State.

The CHAIRMAN. And you don't get nearly enough, do you?

Dr. BEASLEY. Not nearly enough.

Mr. BECERRA. And, Dr. Beasley, we will just speak specifically about your college. Is your budget itemized, that which you get from the greater institution itemized for the Department of Forestry?

Dr. BEASLEY. No. We have quite a bit of latitude in how we allocate our resources.

Mr. BECERRA. But are you given a lump sum or told what amount you would be getting or not, or is it just a matter of going to the well and asking for more money?

Dr. BEASLEY. No. We are given a lump sum to take care of salaries, and then we have an operating, O&M budget as well.

Mr. BECERRA. Now, given all that, if I were to tell you that one of your colleges, one of your departments were siphoning off more money from the overall budget, diverting funds from, say, the School of Forestry, taken from some other area, say the School of Forestry, Dr. Beasley, to another school, what would be the results within the central system of budgeting?

Dr. BEASLEY. Well, I'm not sure I understand the question but I would——

Mr. BECERRA. Let me try to be more specific. I want to make sure you all understand the question.

You have a set budget for the year for the entire institution.

Dr. BEASLEY. Right.

Mr. BECERRA. Your particular college, in this case the College of Forestry was set to get X million, $400 million. You probably wish you could get that much. All of a sudden you find you're getting $325 million for that year.

Would that call into question or begin a process of investigation or inspection of some sort within the offices that manage the budget to find out where those $75 million went?

Dr. BEASLEY. Sure.

Mr. BECERRA. Well, let me ask the same question to everyone else before I proceed to the next question.

If something similar to that happened, Dr. Covington, in your institution, would that cause the institution to go through some review of its budgetary process?

Dr. COVINGTON. If it was done with no explanation it certainly would. But we do have strategic plans, 5-year plans that we follow and you normally choose to enhance areas, so it is not uncommon to shift funds from one category to another as the strategy plan dictates.

Mr. BECERRA. In fact, I would imagine in your case since you are really constrained quite a bit by governmental rules or regulations that you have to do quite a bit of documentation of what goes on, so it would be very difficult for monies to be diverted from one part to another within the institution, I would imagine.

Dr. COVINGTON. It is all public record.

Mr. BECERRA. All public record.

Sister Mary.

Sister MARY REAP. Ours may be a little bit easier. I divert them all the time.

Our budget is driven really by several categories, and in our operational budget there is a certain basic amount that every department and every school receives line by line. But then I have a section that I call zero-based budgeting every year. And, as the institutional priorities are set and our planning process goes through the annual planning review, that pot of monies are given to the priorities of the institution.

Mr. BECERRA. But let's set aside that pot of money that you have and the decisions that you make as the person who runs the institution.

Sister MARY REAP. Well, not just I but those who participate in the budgeting process.

Mr. BECERRA. All right. But let's—okay, now let's set aside those who participated in the budgeting process, were to find that there had been a diversion of funding from one of your departments into another without the budgeting process people's knowledge, would that cause the institution to undergo some type of review, unbeknownst to you and those that allocate the monies within the budget?

Sister MARY REAP. Yes. I suppose it would. It is very unlikely that that could—we don't have any experience of that given our procedure and process. So, I suppose if something mysteriously moved from one category to another, of course there would be a question. It doesn't happen that way.

Mr. BECERRA. Right. And it is good to hear that it doesn't happen that way, but if it did happen do you suppose you would be undergoing some type of review?

Sister MARY REAP. Hypothetically, I presume that we would, if I understand your question correctly about removal of monies that had been allocated—I think that is what you are referring to—to one school or one area suddenly being removed from that entity and being given——

Mr. BECERRA. Used for something you were unaware of.

Sister MARY REAP [continuing]. Someplace else, even by me as president.

Mr. BECERRA. Right. Used for something you were unaware of.

Sister MARY REAP. Couldn't happen.

Mr. BECERRA. Couldn't happen. Okay.

Sister MARY REAP. Couldn't happen.

Mr. BECERRA. But if it did—it can't happen, but if it did would you want to investigate that?

Sister MARY REAP. Yes.

Mr. BECERRA. Okay. Dr. Silber? I don't think your microphone's on.

Dr. SILBER. In Boston University we operate on peer review in terms of programs in the English department or the law school. There will be review of their recommendations by professors in cognate fields. There is an area in which peer review works.

If you're asking how do we allocate the revenues generated by tuition earned by the law school beyond the cost of operating those programs, I don't believe the law school is the proper peer review group to decide that, because selfishness would determine the whole thing.

Mr. BECERRA. That is not my question. My question—what I'm trying to do is get a sense of how you would respond if you had a notion of your pot of money and you in the budget process allocated the money and the following year as you're doing your reviews you find out that the law school, which was supposed to have X amount even after you made some switches in appropriations, all of a sudden had quite a bit more than it had when you first began the budget process the year before without your knowledge, or anyone who gets to allocate the money without their knowledge as well, that the law school was going to get this money and it came from some other part of the institution without anyone's knowledge.

Would that cause you some concern and perhaps a reason to investigate?

Dr. SILBER. Well, it wouldn't happen. If it happened, it wouldn't happen more than once. But I don't think the analogy between that and the Congress applies at all, because I do believe that the Members of Congress, for example, on the Appropriations Committee, can see the national picture and can have a pretty good idea of how they can serve the national interest.

And I believe the success of such projects as the photonics project and others at Boston University demonstrate the wisdom of that process. I don't think that they in any way lay the predicate for an argument that it is not working well, particularly when the result of those earmarked funds is that we become enormously more competitive and more successful in our peer review competition.

Mr. BECERRA. I appreciate your answering my follow-up question. But let me make sure I understand correctly that it wouldn't happen, but if it would happen it would happen only once. Does that mean because you would take steps to ensure that it would not happen again?

Dr. SILBER. Well, yes. I mean sure. I think that I would not know how to assume the responsibility that I have if that were not the case. On the other hand, I assume that the Appropriations Committee is prepared to assume the responsibility for what it does.

One thing that I'm not qualified to do and that is I am not qualified to advise the Congress on how to reform the Congress, and I don't claim any expertise in that and I don't want to appear to be a busybody in that regard.

Mr. BECERRA. And I think we know you are busy enough trying to run a very important institution, so I don't think we would ask you to do that.

But given your answers, if I were to tell you that Congress had a problem that we, especially those of us who are authorizers who sit on the Committee of Science, Space, and Technology to authorize spending on science projects, technology projects, projects that fall within the jurisdiction of this committee are unaware of monies going to particular projects that we never authorize, would that give you—well, let me not put you in the position of Congress.

Dr. SILBER. You see I think that if the Congress wants to put a blind eye on a problem of the $100 billion to $200 billion deficit in scientific research facilities in this country and do nothing in the way of authorizing a $100 billion to $200 billion program to rebuild those facilities, then just because nature abhors a vacuum somebody else in the Congress is going to start working piecemeal on that problem that the Congress has never faced systematically.

Mr. BECERRA. And, Dr. Silber, you bring up a very good point. We don't provide enough funding for research and we are falling behind some other countries in the world who are doing a much better job of funding their institutions to do the research.

But what happens in the case of Congress when we do have that set pot of money, even if it is not enough, when one institution gets it through an earmark that means scores of institutions don't get any of it either, and they are, perhaps, as deserving as any institution that gets an earmark.

Dr. SILBER. But perhaps they're not as deserving either when you consider the outstanding results that have come from the earmarking. And one thing that——

Mr. BECERRA. And a peer review process—a peer review process would tell us that.

Dr. SILBER. Well, I don't know that the peer review process would tell you that. What the peer review process would show you is that the people who are the haves will continue to get more and the people who are the have-nots will continue to get less.

Mr. BECERRA. And I think that is where——

Dr. SILBER [continuing]. Which has been the history of NSF allocations.

Mr. BECERRA. I think that is where you and Sister Mary make a very good point. I don't want you to make the analogy because it is not quite correct, but many people would condemn affirmative action programs because they would say that those institutions that must hire or must make an effort to hire minorities or women are having to take the lesser of the crop, and I must tell you that that is not the case.

But there is a difference between, say, affirmative action in that affirmative action doesn't help one individual. It is meant to help out a class of individuals that has suffered. In that respect, I think the class of institutions that we're talking about here, those that are of lesser endowment, have every right to complain and wish to have some affirmative action in that sense.

But the unfortunate truth is that only few institutions are getting the earmark, and there is a class of institutions that fits the mold of, perhaps, any of the institutions that are represented here today that are being excluded.

I think the question here is thought to say, and I don't think anyone here is saying that the monies that you have received is not being used wisely and is not going to benefit the Nation. But our problem—this is the problem I see. I represent 600,000 people. I represent a State, and ultimately I'm supposed to make policy for the Nation. I have to explain to 600,000 people and each and every taxpayer in this country why it is that I'm allowing monies to be dedicated to certain projects without peer review, without competition, and in areas that some would question. Even if your institution is worth the funding and the investment, I have to be able to explain it to the taxpayer in my district.

Obviously, if it was an institution in my district that got the funding it makes it a lot easier for me to go out there and tell folks I'm trying to do something for the district. And that is what earmarking is about. But that is not—that is not what we're here to do, I don't believe.

And if the funding that you get, the research you do is worth it and can prove itself, pass that muster, then let's do it competitively, because otherwise not only will we feel the heat but ultimately you will too. As, Sister Mary, I think you said, you are feeling the heat because you may have a very worthwhile project but people won't believe it.

Sister MARY REAP. I would also like to push your analogy just one step further——

Mr. BECERRA. Sure.

Sister MARY REAP [continuing]. Now that I have had a little time to think about it. And if—if, hypothetically—a department or a school at Marywood could ever possibly accumulate any funds that I didn't know about, I think the questions asked of me as president would not be from the others about taking it away from that school or that department. Their thrust is to get more for us. They, I don't know, would make a judgment about the quality of the funding that was given to some area of the college.

I think as president our position always is that part of—a major part of our job is to find the resources that our faculty need to fulfill the mission of the college, and so I think one part of the question is, you know, would you take it away and give it to those—the haves get more? Not necessarily. I think with what I would do is continue as I am doing now to find enough for everybody to do what has to be done.

Mr. BECERRA. And, Sister, you make a very good point, but I think the counter to that is that not everyone is able to compete at your level, and that level is having someone who, perhaps, helped shepherd your project through regardless of its merits.

And we have enough information to question each one of you on the merits of the proposal, but I don't think it is worth doing that at this stage because we're not here to pass judgment on the particulars of your project. I think we're the—right now it is introspective. We have to take a look at the way Congress acts, and you, hopefully, will produce something very good for the Nation. And I don't think anyone here intends to do anything but let you succeed in that.

But we should not continue to let people succeed because they happen to have someone who can help shepherd a project through to make them succeed. It should be a matter of giving everyone an opportunity to use the Federal tax dollar that is collected from everyone in this Nation—that opportunity.

I don't mean to get on a soapbox. I should be asking questions.

Sister MARY REAP. If I can just state that I couldn't agree with you more, and I don't think at the present time we have any manner of funding that provides for that.

Dr. SILBER. I want to say I don't believe I could agree with you less. Because I think if you think as a Federal bureaucracy that is going to handle the peer review better than the way it has been handled through the kind of judgment, congressional judgment and agency judgment that has been made in assigning the so-called earmarked projects, I would be very surprised. It would be truly extraordinary.

You see some people argue that if you can't feed all of the children then it is morally better to feed none of them. I think that is totally immoral.

If there are 10 places equally qualified for $29 million but $29 million is the minimum amount that is necessary in order to make a project work, only one out of the 10 are going to get it. And, if they are equally qualified insofar as the national interest is concerned, it doesn't make a damn bit of difference which one of the 10 gets it as long as they're equally qualified.

Now, as long as you grant that the photonics project at Boston University is at least as good as any alternative location where you could have put it, then I don't see what the objection is because A, B, C, and D didn't get it. The job is being done and it is being done with a great leveraging of tax dollars. We're putting over $40 million into it right now.

So, how are you supposing it is going to be better if there were some bureaucracy created that could spend maybe 3 or 4 million of the 29 million, that would look around and cause tons of paperwork to be created while all of this peer review examination went on and finally they decided which way it came. Where you would have one chance in 10 it would be the same way. I don't see that there is a superior alternative.

Mr. BECERRA. I'd love to continue, but I know, Mr. Chairman, my time has expired. And I thank all the panelists for their time, their answers to the questions, and quite honestly their testimony to give us some information on how we should handle this particular issue of earmarking.

The CHAIRMAN. If we move quickly, Mr. Hoke and Mr. Valentine can each have 5 minutes to take a shot at you. Then I'll take a shot.

Mr. HOKE. Thank you, Mr. Chairman. I will——

Mr. VALENTINE. Mr. Chairman, before the gentleman proceeds, so you can know how to measure your shots, I have been undertaking the business of the subcommittee, so I didn't bring sufficient ammunition with me. So I will yield back to the chairman and others any time that you had considered for me.

The CHAIRMAN. Thank you, Mr. Valentine. But you will have to go answer the roll call and so will Mr. Hoke. That is why I said 10 minutes.

Mr. HOKE. Do you want me to proceed before the vote or——

The CHAIRMAN. Proceed, Mr. Hoke. Yes.

Mr. HOKE. Okay. Thank you, Mr. Chairman.

The CHAIRMAN. We will return after the vote, too.

Mr. HOKE. We will return after the vote?

The CHAIRMAN. Yes.

Mr. HOKE. All right. I think this is a fascinating discussion. I think it is fascinating for a number of reasons, not the least of which is, frankly, the spot that it kind of puts you on. I think that one of the things you're being asked to do, and I know you will disagree with this, is to defend what is ultimately and essentially an indefensible position.

But the elaborateness and ingenuity and cleverness and passion with which you defend it is admirable. I think it is human nature. I think if I were in your position I would be in exactly the same place. And I think that the protesting that you will bring forth to my comments just made are all a part of that.

Frankly, from this side of the—from this side of the dais it is very difficult to not see this from a very different perspective than the one that you have, and that is that, you know, powerful Members of Congress are in a position to do something good for their district whether it be for purely political or partly political or purely scientific or partly scientific motivations get funds earmarked.

And I guess the first question that—and for that reason I think it is very difficult, and I think you really are in a—I think it is hard to ask the kinds of questions that might be fruitful from your panel.

But I want to—rather than duck the stuff that Mr. Becerra was saying he wasn't interested in, I am actually interested in some of these projects and I want to get into that. But I think I'd like to ask first, Dr. Silber, from your remarks you indicate that you think that we need $100 billion or $200 billion to rebuild the scientific infrastructure of the United States academic scientific community. Let's say that it is $200 billion.

Would you suggest that we dole that out from the United States Congress by earmarks?

Dr. SILBER. It depends on how you set the program up. If you were to set up a program that was large enough to begin to cope nationally with the problem, and you set criteria that ensure regional distribution, and you set other criteria that ensure that the distribution will go not only to the institutions that have hundreds of millions of dollars of endowment but will go to institutions where the funds will enable them to do something that they've never been able to do before, I think you can make a splendid project along those lines.

Now, I think that a threshold sum in order to do that is probably something in the order of $25 to $50 billion. Otherwise, you are not talking about enough to address that problem nationally.

I think that sometimes we have to scale up and say this is a problem for the next 10 years. I think, for example, the decision of the Congress to abandon the SSC was a decision to destroy the future economic and defense posture of the United States in the 21st century.

Mr. HOKE. You don't think that is a bit of an overstatement?

Dr. SILBER. No, I don't think it is a bit of an overstatement at all.

Mr. HOKE. You're on record now as saying that we have destroyed the future defense and scientific posture of the United States going into the 21st century as a result of killing SSC.

Dr. SILBER. We have seriously impaired it.

Mr. HOKE. I thought you said destroyed. Maybe I misunderstood you.

Dr. SILBER. Well, if I said destroyed, that was what we would call Texas hyperbole.

Mr. HOKE. Then it was a bit of an overstatement?

Dr. SILBER. Yes, but not very far off the mark. A serious diminution of the scientific defense and economic capacity of the university as a——

Mr. HOKE. Well, when you talk about regionalism and trying to get some balance, that is exactly what this process, as poorly—as poorly as it works, is designed to do, and that is the process of authorization followed by appropriation. And it is the earmarking process, or it is the earmarking technique that completely circumvents that process.

The whole idea is that we would go through, first of all, the authorization and then the appropriation, and that is something that earmarking does not account for. What I'd wonder is did you submit your proposal to an authorizing committee as well as to the appropriation committee?

Dr. SILBER. I don't recall—no, I don't think we did because there is no authorization that would have covered this grant. When you see that the NSF authorization for facilities amounted to something like $37 million——

Mr. HOKE. Wait. That is not the case, Doctor. I mean everything that is—every money that is to be spent in the United States Congress is, unless we waive the rules, it must be authorized. So clearly there is a committee that could authorize that money. There is no money that can be appropriated except for a waiver of the rules that doesn't get authorized first.

Dr. SILBER. I'd have to go back and find out. I can't tell you just from memory whether an authorization submission was made. But it was certainly in response to a——

Mr. HOKE. It could have been funded in the Department of Defense authorization.

Let me follow up, because I'm going to run out of time. I want to follow up specifically on the Appropriations Act on the Center for Photonics Research.

Your written testimony, Doctor, claims that earmarks address national needs which are not otherwise provided for. But the Departments of Commerce and Defense both provide for photonic funds. Why didn't BU—or did BU, did it compete for those funds through the Commerce and Defense? And if it didn't, why didn't it?

Dr. SILBER. Well, I think we submitted our proposal to Defense and I think we've guided the nature of the project along the lines that were provided by the Defense Department. And I think that we have satisfied the Defense Department that we're putting together a truly splendid program to meet their objectives.

I would like to see, if it is the case that there is no objection to the quality of our program, which has been said by very many Members of this committee, then I'd like to know what the objection is.

If the process by which we got it results in an absolutely first-rate project, then I think the Congress should be very proud of the fact that it could do something right.

Mr. HOKE. Well, the objection is equity. The objection is abuse of the process. It is circumvention of the whole representative system. That is the objection.

Dr. SILBER. I don't think so. The Appropriations Committee——

Mr. HOKE. I know you don't think so.

Dr. SILBER. You see I have a right to petition the Congress for a redress of grievances and where there is no national program to answer to the need for about $100 billion in deficit for scientific facilities as estimated by the National Science Foundation, then I think that I am exercising my constitutional right when I go to my Congressman or my Senator and I say, "Can you help me?"

Now, if the Congress doesn't believe that a taxpayer and a citizen has a right to seek redress of grievances in the Congress, then they better have a constitutional amendment.

Mr. HOKE. Clearly you have that right. Our question and the reason we are examining this at this level is has the process been abused.

Dr. SILBER. I don't think it has.

Mr. HOKE. Of course. You got the grant.

Dr. SILBER. Well. But why should you think it has? Are you criticizing the grant?

Mr. HOKE. Well, let me follow up with another question. DOD initially refused to fund this proposal for photonics for BU citing that it was superficial and not unique. The faculty were "rather unknown in the field of photonics" and that DOD already supported "many excellent photonic centers."

What is the difference between the original proposal that you made and then the revised proposal?

Dr. SILBER. Well, I think the revised proposal is not very different, but I think that there is a real question about the objectivity of the people that exercised the judgment you were quoting there, and I think the qualifications, for example, Donald Fraser, a member of the National Academy of Engineering and a former director of the Draper Laboratories and an Under Secretary of Defense has credentials that make it look ludicrous to question the competence of the people who would be involved.

And, as a matter of fact, at that place where there is not supposed to be competent faculty they have developed a blue diode, they have developed a blue laser which is a pretty significant achievement, remarkable indeed if that assessment of the inadequacy of those personnel were in any way objective.

Mr. HOKE. You also stated that you had tried for several years to obtain funding for a photonics center at BU prior to seeking the earmark. Can you tell me about the attempts that you made and why they failed?

Dr. SILBER. No. I would have to—if you want me to, I can go back to Boston University and try to dig up the records. But it is a long continuous process. I have been seeking funds for the university for the past 24 years on a rather continuous basis.

Mr. HOKE. But you don't know specifically on this photonics center what had been sought previous to the attempt at getting the earmark?

Dr. SILBER. I worked very hard on that last project, and I remember the final stages of it, but I don't—I'd have to go back and refresh my memory from the records in order to give you the full background.

Mr. HOKE. The last question that I wanted to ask you is that your written testimony claims that your proposal "grows out of the DOD Critical Technologies List," which was issued in July 1992, almost a full year after you received the earmark. Did you consult with personnel who were compiling that list before it was issued?

Dr. SILBER. No. I think that that priority certainly existed well before 1992. It may be in the 1992 report, but photonics wasn't discovered in 1992 nor was its strategic importance discovered in 1992. And we didn't get the money until about—until just very recently, long after that was out.

Mr. HOKE. But you applied for it well before and you had said that the proposal grew out of that specific technologies list which was issued well after the application.

Dr. SILBER. Well, it didn't grow out of the list. It grew out of the priority, and the priority in the Department of Defense predates 1992.

Mr. HOKE. So, in other words, the statement that it grew out of that specific list that was published in '92 is not—I'm misinterpreting it or——

Dr. SILBER. No. I think you're being picky to the point reducing it to an absurdity.

Mr. HOKE. I am being picky, Doctor. I am being picky. There is no question about it. I think that this is a time for pickiness.

It is clear that you have decided that there is an agenda of Boston University's which is a higher agenda and a greater priority than the agenda of the United States Congress, and that if that means going around and getting to a funding source that somehow is able to circumvent the regular legislative process that you are going to do that.

Dr. SILBER. No——

Mr. HOKE. Thank you, Mr. Chairman.

Dr. SILBER. Mr. Chairman, I'd like to take exception to that last remark. I don't ever suppose that the interest of Boston University takes precedence over the interest of the Congress, nor do I accept the notion that I have in any way by passed the Congress when Congress acts legally to do what they have done in our case.

The CHAIRMAN. Let me indicate that we have about 2 minutes left to go answer the roll call. I intend to take a brief recess. Mr. Valentine will come back and will resume the chair and will complete the process here. You're through the worst of it, so you can relax for a few minutes.

The worst of it is going to be me, and I'm not sure I'm going to be able to come back. But we will ask you to respond to questions in writing in order to complete the record here, if it is necessary to do that.

[Responses to additional questions submitted by Dr. Silber, See Appendix B, Item 3.]

The CHAIRMAN. The committee will be in recess for about 10 minutes or so.

[Recess].

Mr. VALENTINE. The subcommittee will be in order—full committee, excuse me. I've functioned so long as an underling, it's hard for me to resume the responsibility of full chairman.

I want to explain the reason for this delay. We were searching for someone else to preside, but we're not sure that other Members have any questions. I have been occupied otherwise at a subcommittee hearing, the reason that I was not here earlier.

So, what we propose to do is to, after I have some questions to ask, the same question of each one of you, and you might reply here or by written response. What we will do is to recess the full committee and will reconvene October 6 at 9:30 in this same room.

The final question is I would like to ask each one of you if you would tell us if you in connection with the project, the funding that we're talking about, if you have a lobbyist? Beginning on this end, if you wouldn't mind telling us.

And, if you have a lobbyist, what is the name of the lobbyist and how much you paid them?

Doctor.

Dr. SILBER. When I came to Boston University in 1971 I immediately moved to open a lobbying office, an office representing the university here in Washington. That had been the practice at the University of Texas from which I came. They had an office here as do so many of the universities.

I opened that office and had an annual operating budget for the Washington office of about a quarter of a million dollars a year, and I found that I was operating amateur hour. That I would come to the Congress to meet people. The appointments wouldn't be kept. I wouldn't be seeing the Congressmen who were on the right committees for the legislation or redress that I was seeking.

And finally, after about 3 years of that, I decided it was wasted money and that for the same amount of money I could have professional representation. The professional representation was called to my attention by two events. One was the establishment of a nutrition center in Boston under the aegis of Tufts University, which was represented by Schlossberg and Cassidy at that time, and it was then I met Gerald Cassidy and found him to be very effective in guiding a piece of legislation to the benefit of Tufts, which was an extraordinarily appropriate university in which to have a center for nutrition.

Next, I was asked to testify before the committee of Senator Brooke and Senator Magnuson on an issue of whether or not they should appropriate funds for a library at Tufts and a library at Georgetown University in those foreign relations programs that were run there; the Fletcher School in Tufts and another one in Georgetown. And there again I was happy to testify on their behalf.

And the question of peer review came up and I pointed out that there were no two international relations programs in the United States more distinguished than the one at Georgetown and the one at Tufts, and consequently that I didn't know what the peer review would accomplish. But that regard to the grants for the libraries, peer review would come in in the selection of architects and contractors.

In any event, that again was handled by Cassidy, and I had noted the effectiveness with which he operated because both of those grants were made, and consequently I decided to close down the office of Boston University in Washington where we were spending, as I said, a quarter of a million dollars a year, and hire Gerald Cassidy, who has represented us in Washington since that time.

Mr. VALENTINE. All right, sir. The third part of the question was if you would tell us how much you paid the lobbying firm?

Dr. SILBER. I don't recall the exact amount, but it will run somewhere in the neighborhood of $400,000 a year. If you adjust the 1973–74 quarter of a million dollars that I was spending for amateur hour in our own shop, it would amount to, I suspect, today something in the order of $600,000. So, we're spending less by having professionals represent us than we were spending before.

But as far as I know, I don't know of a major university that does not have lobbyists.

Mr. VALENTINE. Well, Doctor, I don't mean to cut you off. I'm not attempting to make any judgment. We just—you know, as to whether or not—and I'm not attempting to suggest that there is anything inherently wrong. We just want to get this in for the record, and I was asked by the chairman to make this inquiry, to ask these questions.

And, of course, they're my questions too because I think that is something that the committee is entitled to know.

Sister Reap.

Sister MARY REAP. No, Marywood did not have a lobbyist in conjunction with our project. I suppose I would have to say I am the chief lobbyist for Marywood and they don't pay me nearly enough.

Mr. VALENTINE. And there is no one I am sure who is able to compete with you.

Dr. Covington?

Dr. COVINGTON. Yes. Sam Houston State uses a group called the Advocacy Group. We pay them $3,000 per month.

Mr. VALENTINE. Dr. Beasley?

Dr. BEASLEY. No, sir, we do not.

Mr. VALENTINE. All right, sir.

Well, I'm here for short tenure. I hate to recognize—well, excuse me.

Congressman Ehlers is recognized.

Mr. EHLERS. Thank you, Mr. Chairman. Just a brief comment. I certainly appreciated you coming for this hearing. I came from the academic world and I know what a chore it is to come to Washington and make these sort of comments. But I also want to comment on the whole topic of academic earmarks.

I think, Mr. Chairman, it is a sad situation when—that we even have to conduct these hearings. There is a long and honorable tradition within the academic community of basing financial support on ability and on ideas, and I'm afraid much of that has gone by the board in the last decade with the introduction of the earmarking process.

So, I just want to express my concern about that, and also my support for Chairman Brown, and for you, Mr. Chairman, in your efforts to get a handle on this, find out what's actually happening and, perhaps, curtail the practice, or better yet, end it.

Thank you.

Mr. VALENTINE. The chair thanks the gentleman from Michigan, and would like to recognize the presence of the distinguished lady from Washington, Ms. Dunn, if you have any.

Ms. DUNN. No, thank you.

Mr. VALENTINE. Well, with that then I will state again that the committee is not in recess—or is not adjourned but it is in recess.

Let me stress also the fact that we will not need to call any of you back—we do not do that—for the purpose of further interrogating you, as I understand it. We may have written questions that may be submitted to you by Members, or by the Chairman or other Members of the committee, and within reason if you would supply us with answers we would appreciate it.

So, with that the business of the committee on this occasion is concluded.

[Whereupon, at 12 noon, the committee was recessed, to reconvene Thursday, October 6, 1994.]

APPENDIX B

Academic Earmarks: An Interim Report by the Chairman of the Committee on Science, Space, and Technology

Chairman George E. Brown, Jr.

August 9, 1993

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515

August 9, 1993

This Interim Report is issued pursuant to the oversight responsibility of the House Committee on Science, Space, and Technology as set forth in "Rule X. Establishment and Jurisdiction of Standing Committees" which says: "3.(f) The Committee on Science, Space, and Technology shall have the function of reviewing and studying on a continuing basis, all laws, programs, and Government activities dealing with and involving nonmilitary research and development."

As Chairman of the Committee, I take full responsibility for the contents of Academic Earmarks: An Interim Report by the Chairman of the Committee on Science, Space, and Technology. I am aware that it differs from most oversight reports in that it focuses largely on activities of the Congress itself, rather than activities of the Executive branch, or of organizations in the private sector. I likewise am aware that the Report runs the risk of offending respected colleagues in the House or Senate, or unfairly criticizing an institution performing important public services in its state or community, or even implying that perfectly legal and respectable lobbying activities may be inappropriate in the context of public grants for university research facilities.

If I have so offended, I apologize. I only ask that the readers of this Report, in the Congress and out, consider the larger issues which we have tried to highlight.

I believe that the rational, fair and equitable allocation and oversight of funds in support of the nation's research and development enterprise is threatened by the continued increase in academic earmarks. To put it colloquially, a little may be okay, but too much is too much.

I believe that the intricate web of checks and balances created by the founders more than 200 years ago is threatened by the emergence of a new power center, the very senior Members of the House and Senate Appropriations Committees, of both parties, working together to exercise more control over legislative policy, including the earmarking of funding for a variety of purposes, such as academic research and research facilities.

History teaches us that when a complex system of checks and balances is disrupted it may lead to serious problems in the system. This is more likely to occur in the House than in the Senate, but will affect both. In the House, the Appropriations Committee represents a much smaller percentage of the body than in the Senate (14% vs. 29%) and the very senior members (the Cardinals, including ranking Republican members) an even smaller percentage (6% vs. 26%). Likewise, House Members are not allowed to serve on both Appropriations and Authorizing Committees as they are in the Senate. As a consequence there is proportionately a much larger percentage of House Members who may feel that their co-equal status as Members of Congress is threatened very substantially by the emergence of a new major power center, taking its power from the large majority of Authorizing Committee Members who are deprived of meaningful participation in the legislative process.

Chairman Natcher, to his great credit, has shown much sensitivity to this issue. The subcommittee which he chairs (Labor, Health and Human Services, Education) has set an example of limiting the use of academic earmarks. He has urged other subcommittee chairs to follow his example in limiting earmarks and urged them not to seek protection from points of order against earmarks from the Rules Committee. I believe that he perceives the possible adverse effects on the ability of the House to accomplish its business if the current course is not quickly and substantially changed. I commend him for his wisdom and good judgement.

GEORGE E. BROWN, JR.
Chairman

Academic Earmarks: An Interim Report by the Chairman of the Committee on Science, Space, and Technology

Chairman George E. Brown, Jr.

Introduction

How would a 16th century English farmer cull his swine from the village herd? One way to identify his pigs would be to check their "earmarks." Farmers would mark the ears of their livestock as a way of demonstrating ownership. The term earmark quickly took on a broader meaning denoting anyone or anything owned by another. For example, an English religious tract from 1612 noted, "I will here let them passe as ear-markt slaves of Satan."[1]

Appropriations bills and their accompanying reports are massive documents detailing, usually in general programmatic terms, how the budget of the United States Government should be allocated. The Appropriations Committees sometimes desire to have certain programs or institutions receive a guaranteed sum of money. In those cases, they will identify a purpose, a program and a sum of money, thereby directing the executive branch to carry out that specific action, when the bills are approved by the Congress.

This power of Congress to direct the executive branch to spend money in certain ways is one of the most important in the legislative arsenal. Embedded in the Constitution and rooted in the founding architects' desires to provide a check on executive discretion, the ability to specify that certain programs will be funded is one way that Congress can force a recalcitrant President to carry out the law. Unfortunately, as profound as the origins of this power may be, it can be subject to abuse in ways that the drafters of the Constitution would not have anticipated. Furthermore, no effective checks on this power currently exist.

In our time, the term earmark is identified with appropriations that are tied to specific locations or institutions and which have not been requested by an Executive Branch Department, approved by the President and included in his budget, and/or included in authorizing legislation approved by the House and Senate and signed by the President. Of all the earmarks in appropriations bills, perhaps the most disturbing are funds for specific academic programs. This nation has long supported and encouraged the expansion of higher education through generalized programs that offered equal access for all, rewarding both merit and need. Academic earmarks fly in the face of this tradition by rewarding a select few institutions, generally on the basis of the influence that comes from having a supportive Representative or Senator on the Appropriations Committees.[2]

As the table below indicates, the number of academic earmarks has been on the rise--moving from a negligible level in the early 1980s to hundreds of earmarks in the last few years. We are now treated to an annual parade of schools stepping forward to claim their unauthorized legislative gains--sometimes for a building, sometimes for a research program--as appropriations bills pass Congress.

Table 1
Growth in Earmarked Academic Projects & Dollars, 1980-1992

Year	Number of Specific Earmarks	Dollar Amount
1980	7	$10,740,000
1981	0	0
1982	9	$9,370,999
1983	13	$77,400,000
1984	6	$39,320,000
1985	39	$104,085,000
1986	38	$110,885,000
1987	48	$163,305,000
1988	72	$232,392,000
1989	208	$299,026,200
1990	252	$247,976,333
1991	279	$470,279,499
1992	499	$707,989,000
Total	1,470	$2,472,769,031

Source: CRS, "Trends in the Distribution of Apparent Academic Earmarks in the Federal Government's FY1980-92 Appropriations Bills," September 1992, p. 8.

Many arguments are advanced to defend academic earmarks: it is claimed that they allow small, less populous states some share of federal R&D dollars; that they break the stranglehold of the "elite" research institutions; that they stem from inadequate funding for facilities in existing programs; that they meet real national needs in targeted ways.

There is undoubtedly some element of truth in many of these claims, but all of them fail to communicate the disturbing nature of academic earmarks: it is a process that is built on closed door consultations (often facilitated by high-priced lobbyists); it is a process that grows through log-rolling among Appropriations Committee Members attempting to do favors for constituents; it is a process that destroys rational efforts to set priorities tied to national needs; it is a process that circumvents the right of the great majority of the House and Senate to have a voice in determining the expenditure of public funds; most fundamentally, it is a process that fails to protect the taxpayers' investment. There is neither accountability nor checks in the system the earmarkers have set up.

This is not to say that every academic earmark is wasted money. However, there is no way to gauge the quality of a project supported through earmarks and no way to turn the spigot off. Even when an earmarked project appears promising or delivers a usable product, there is an opportunity cost that comes with that funding. Lurking off in the shadows are those other projects--projects holding more promise, projects more to the heart of an agency's charge, projects designed to meet real national needs as determined by the President or by authorizing legislation that gains the approval of a majority in the House and Senate--that could not be funded and were passed by for reasons that have everything to do with political clout and nothing to do with merit.

The Committee's Work To Date

It was out of a desire to shine some light on academic earmarks, and what we are buying for our money, that the Chairman of the Committee on Science, Space, and Technology undertook an investigation of earmarking. The fairest way to distribute our research dollars is through competitive, peer reviewed awards programs. This is the method that holds out the greatest promise for encouraging the best ideas and best innovations. Members of Congress are not better prepared than experts to judge the quality of proposals for research or research facilities.

To find out more about the most recent herd of earmarked academic projects, the Committee sent out fifty letters to schools that received earmarks in the Fiscal Year 1993 appropriations bills (or accompanying reports). The schools chosen were of every size, location, and reputation for research. Of the fifty, the Committee received forty-eight timely responses. Two schools, Hahnemann University in Philadelphia and Clark Atlanta University, only responded in late July, 1993 and their answers are not folded into this report.

The quality of the responses varied enormously. Some were proud of the work they had undertaken and seemed happy to crow about it. Some wrapped themselves in one of the many claims noted above--that they were in a small state, or they weren't Harvard, or they were undertaking work of national importance--and then went on to brag about their program. Others were as curt and uninformative as good manners would tolerate. Some tried to convince the Committee that their efforts were worthwhile because long-time friends of Chairman Brown's were associated with the program. Some reminded us that the Chairman had toured their research facility and expressed personal amazement at their work--an example that eloquently makes the case that a Congressman's opinion is a poor substitute for peer review. Almost a dozen "cc'd" friends on the Appropriations Committees, apparently to let us know that they had patrons inside the beltway. Some simply seemed baffled by the questions.

The wide range of responses, differing in quality and level of detail, makes it difficult to do a rigorous comparative analysis. Science, Space, and Technology Committee staff are still working with some of the schools to fill in gaps in the information provided. In addition, the staff have been collecting other information from a variety of sources to get a better perspective on how academic earmarks are awarded, how they are administered and what the nation is getting for its money. A final report will be released in September when the Committee has finished its review of earmarking.

Earmarking in Perspective

According to the Department of Education, there are 2157 four-year universities and colleges and 1444 two-year colleges in the United States.[3] Yet, in fiscal year 1992 only 170 of these schools shared in the $708 million the Appropriations Committees earmarked that year.[4] What is it about those schools, less than 5% of all institutions of higher education, that makes them so special?

Public and private schools can be found among the winners. Some are religious while others non-denominational. Some are enormously successful at winning competitive federal research money--10 of the top 20 recipients of competitively awarded federal research dollars are among the recipients of earmarks. The earmark winners range in size from more than thirty thousand students to barely a thousand full-time students.

The only thing these schools seem to have in common is that a Member of Congress, usually a member of the House or Senate Appropriations Committee, has decided that a particular project at a particular school is worthy of federal support. In short, they all have friends in high places. This observation is borne out in the table below which tracks FY 1992 academic earmarks ranked by state against seniority positions on the Senate and House Appropriations Committees.

Table 2
Top Twenty Apparent FY 1992 Academic Earmarks Ranked by State With Senators and Representatives on Appropriations Committees Ranked by Seniority

Earmark Rank	Senate	House Chairs & Ranking Members	Other House Members
1. Massachusetts			Early, D; Atkins, D
2. Alaska	*Stevens, R*		
3. Pennsylvania	*Specter, R*	*Murtha, D;* ***MCDADE, R;*** *Coughlin, R*	Gray, D
4. New York	*D'Amato, R*	*Green, R*	McHugh, D; Mrazek, D
5. West Virginia	***BYRD, D***		Mollohan, D
6. Michigan		*Traxler, D; Pursell, R*	Carr, D
7. Louisiana	*Johnston, D*		
8. California		*Roybal, D; Dixon, D;* *Fazio, D: Lewis, R;* *Bill Lowery, R*	Pelosi, D
9. Maryland	*Mikulski, D*		Hoyer, D
10. Texas	*Gramm, R*		Wilson, D; Delay, R; Coleman, D; Chapman, D
11. Indiana		*Myers, R*	
12. North Dakota	*Burdick, D*		
13. South Carolina	*Hollings, D*		
14. Alabama		*Bevill, D*	
15. Kansas			
16. Hawaii	*Inouye, D*		
17. Minnesota			Sabo, D; Weber, R
18. New Jersey	*Lautenberg, D*	*Gallo, R*	Dwyer, D; Gallo, R
19. Florida		*Lehman, D*	Young, R
20. Oregon	***HATFIELD, R***		AuCoin, D

Source: State rankings derived from CRS report, "The Distribution of Apparent Academic Earmarks in the Federal Government's FY 1992 Appropriations Bills," September, 1992.

BOLD CAPITALIZED text indicates a Chair or Ranking Member of the full Appropriations Committee.

Italicized text indicates a Chair or Ranking Member of an Appropriations Subcommittee.

Seventeen of the top twenty states receiving academic earmarks have Senators and/or Representatives who were Appropriations Committee Chairs or Subcommittee Chairs or Ranking Members on the Appropriations Committee. There are three exceptions: Massachusetts, Kansas and Minnesota. The top twenty states, represented on the Appropriations Committees by just twelve Senators and thirty-four Representatives, received 78.7% of all apparent academic earmarks--more than $557 million--in the fiscal year 1992 Appropriations Bills.

One remarkable thing is how little the list of schools that receive these earmarks changes from year to year. Table 3 shows the top ten recipient schools in fiscal year 1992. Compare this list to Table 4 which shows the top twenty cumulative earmark recipients for fiscal years 1980 through 1992--a kind of "all-time top twenty."[5]

Table 3
Top Ten 1992 Recipients

Schools	Dollars
1. University of Alaska	$45,063,000
2. Boston University	$29,000,000
3. Michigan State University	$23,172,000
4. University of Maryland	$22,770,000
5. Wheeling Jesuit College (WVa)	$21,000,000
6. University of Rochester	$20,300,000
7. University of West Virginia	$19,625,000
8. University of Hawaii	$16,941,000
9. Indiana University	$13,688,000
10. University of North Dakota	$13,681,000

Source: "The Distribution of Apparent Academic Earmarks in the Federal Government's FY 1992 Appropriations Bills," Congressional Research Service, September, 1992.

Of the top ten schools in 1992, five are among the all-time top ten (the University of Alaska, the University of West Virginia, the University of Hawaii, the University of Rochester and Boston University). The University of North Dakota, Michigan State University and Indiana University are all in the next tier of all-time earmark recipients. Only two schools, the University of Maryland (#23 all time) and West Virginia's tiny Wheeling Jesuit College (#21 all time with $29 million for a school of about 1000 full time students) are not among the top twenty all-time recipients--though it is likely that if these figures included fiscal year 1993 awards, they both might crack the line-up.

Table 4
Top Twenty Earmark Recipients, 1980-1992

Schools	Dollars
1. Iowa State University	$91,563,300
2. University of Alaska	$91,153,000
3. Oregon Health Sciences Univ.	$84,900,000
4. Louisiana State University	$70,994,000
5. University of West Virginia	$70,967,000
6. University of Hawaii	$69,852,000
7. University of Rochester	$65,300,000
8. Florida State University	$58,677,500
9. University of Alabama	$57,000,000
10. Boston University	$56,500,000
11. Tufts University	$46,008,000
12. University of North Dakota	$43,368,000
13. Michigan State University	$42,735,333
14. University of Illinois	$39,241,000
15. University of South Carolina	$36,750,000
16. University of Oregon	$35,200,000
17. Indiana University	$34,924,000
18. University of Florida	$34,290,000
19. North Dakota State Univ.	$30,743,333
20. Loma Linda University	$29,500,000

Source: "Trends in the Distribution of Apparent Academic Earmarks in the Federal Government's FY 1980-92 Appropriations Bills," Congressional Research Service, September, 1992.

All earmarked funds are not necessarily wasted, but it is neither a fair nor a wise way to distribute our scarce federal dollars in support of education and research. It is a process that undermines the existing system of peer and merit review. Just as importantly, earmarks are beginning to eat into the base programs of the federal agencies we rely on to fund our scientific enterprise. Finally, earmarking gets some of our agencies far-afield from their institutional mandate.

For example, earmarking has put the Department of Energy (DOE) in the hospital-building business. The executive agency that is charged with meeting this nation's energy needs and supporting research on the frontiers of the physical sciences helps build things like cancer institutes and ambulatory care facilities. The Department has not asked Congress for permission to build these medical facilities; rather the Appropriations Committees have decided that DOE ought to be building medical facilities along with their work on advanced electric vehicle designs, high energy physics and the strategic petroleum reserve. As a result, between fiscal years 1990 and 1993, DOE has seen $171.8 million of its scarce research dollars directed towards strengthening medical facilities at ten different schools.

This is an unquestionably perverse outcome, but is it more perverse than the $8.75 million for a planetarium that NASA has been ordered to build for a small, two-year college in an upper-midwest state? Perhaps it makes sense for NASA to build planetariums (though according to NASA officials, they can't remember ever having funded a planetarium before), but this college does not offer a major in astronomy, physics, physical sciences or even general science.[6] This is undoubtedly a fine school and they will certainly enjoy their planetarium, but it is hard to see how that expenditure helps meet a national need or fits with NASA's institutional interests. What is it about this college that makes it stand out as more worthy for a multi-million dollar facility than any of the other 1444 two-year colleges (not to mention the 2157 four-year schools)? The answer is simple: at the time of the earmark, a member of the state's delegation chaired an Appropriation Subcommittee with responsibility for NASA's appropriation legislation.

Not all earmarks stray so far from an agency's mission or need. For example, the Federal Aviation Administration (FAA) has spent $104 million since 1983 in support of Airway Science programs in the United States. This program began life in the wake of President Reagan's firing of air traffic controllers. In an effort to provide trained employees for the FAA, Congress authorized an Airway Science demonstration program. However, when outside reviewers looked at the program in 1990, they found that of the 8,501 new employees the FAA had hired between 1983 and the end of 1989, only 41 were Airway Science graduates. Despite that (and at least partly due to outside political pressure), the FAA moved to make the Airway Science program permanent in 1990.[7]

Congress has found the Airway Science program an especially popular beneficiary for earmarking. Of the $104 million allocated to this project, $79 million--76% of program funds--have come in the form of earmarked appropriations.[8] As the table on the next page shows, of the 38 schools to receive money under this program, 21 received their grant competitively. These competitive grants had an average value of $542,895. The $79 million in earmarked funds went to just 17 schools--a whopping average of $4.65 million per school. In other words, the average earmarked award was almost nine times as great as the average competitive grant.

Table 5
Airway Science Program Grant and Earmark Recipients
FY 1982-93 Cumulative Totals

School	State	Competitive Grants ($)	Earmarked Awards ($)	Total Federal Support ($)
University of Alaska, Anchorage	AK		6,884,000	6,884,000
Florida Memorial College	FL		7,296,000	7,296,000
Southern University	LA		4,925,000	4,925,000
Northeast Louisiana University	LA		4,000,000	4,000,000
Delta State University	MS		2,201,100	2,201,100
North Dakota State University	ND		989,000	
University of North Dakota	ND		23,731,890	23,731,890
Polytechnic University	NY		1,425,000	1,425,000
Fairmont State College	WV		300,000	300,000
Auburn University	AL	220,255	237,500	457,755
Henderson State University	AR	46,500	2,235,000	2,281,500
Florida Institute of Technology	FL	1,131,000	237,500	1,368,500
Embry-Riddle Aeronautical Univ.	FL/AZ	1,879,100	12,925,000	14,804,100
Daniel Webster College	NH	896,635	3,000,000	3,896,635
Dowling College	NY	562,565	7,500,000	8,062,565
Middle Tennessee State Univ.	TN	961,208	806,000	1,767,208
Central Washington University	WA	696,020	175,000	871,020
Arizona State University	AZ	693,456		693,456
National University	CA	1,173,735		1,173,735
San Jose State University	CA	362,800		362,800
California State University	CA	48,082		48,082
Metropolitan State College	CO	575,000		575,000
Southern Illinois University	IL	936,338		936,338
Parks College of St. Louis Univ.	IL	547,165		547,165
Purdue University	IN	128,956		128,956
Louisiana Tech University	LA	495,000		495,000
University of Maryland, Eastern Shore	MD	744,300		744,300
Central Missouri State University	MO	145,400		145,400
Jackson State University	MS	621,075		621,075
Elizabeth City State University	NC	207,050		207,050
University of Nebraska, Kearney	NE	162,315		162,315
Chadron State College	NE	50,250		50,250
Ohio State University	OH	1,348,300		1,348,300
International American Univ. of Puerto Rico	PR	1,371,568		1,371,568
Tennessee State University	TN	800,000		800,000
Texas Southern University	TX	771,468		771,468
Utah State University	UT	218,525		218,525
Hampton University	VA	2,550,000		2,550,000
FY 91 Funds to be Awarded		1,275,8334		
FY 92 Funds to be Awarded		3,761,000		
Total		**$25,380,900**	**$78,867,990**	**$104,248,890**

Source: Data provided by the Department of Transportation.

In May 1993, the Inspector General (IG) of the Department of Transportation released a review of this program. The IG found that the FAA did not have a real need to attract additional youth to the field; there were plenty of qualified candidates already available in the professions the program was designed to encourage and there is no crisis (such as a massive firing of air traffic controllers) to justify continuing the program. The IG observed that, "The AWS (Airway Science) Program has not achieved its objective, which was to provide FAA with college-educated, technical employees that would compare favorably with traditionally OPM (Office of Personnel Management) hired-employees.[9]" The conclusion the IG reached was that the program should be terminated.

FAA management concurred with this recommendation. The management response included these lines: "Effective with FY 1993, FAA discontinued its request for AWS grant funds. FAA continues to express to the staff members of the House and Senate Appropriations Subcommittees its nonsupport of designated AWS grant awards and will not include AWS grant funds in future budget submissions. Should these congressionally designated funds continue, FAA may elect to request the committees to redirect the funds.[10]" How successful was FAA's effort to stop funding the Airway Science program in fiscal year 1993? The Appropriations Committees directed $30 million be awarded to eight schools, with awards ranging between $175 thousand to $11.5 million.[11]

The Airway Science program, with its origins in a real national need, has outlived its usefulness. Yet FAA has been unable to stop the program because too many schools have too many friends on the Appropriations Committees. So the money just keeps coming, erecting buildings and enticing thousands of young Americans to enter academic programs based on a misleading promise of jobs at the other end.[12]

Lobbyists

Perhaps no aspect of academic earmarking more vividly demonstrates the flaws in the system of funding science and technology than the reliance by earmark recipients on lobbyists. Of the fifty schools the Committee wrote to regarding fiscal year 1993 earmarks, twenty-one had registered lobbyists on their payrolls during the 1992 calendar year. (It is not always possible to identify lobbyists because they often fail to register or report on their clients.) Table 6 below shows the schools, their lobbyists and the size of their earmark. Clearly, the big player in this game is Cassidy and Associates; of the 21 schools with an identifiable paid lobbyist, Cassidy and Associates accounted for six of those contracts. A close second, at least in our sample, was the Advocacy Group, representing four schools.

Table 6
Schools that Received an Earmark in FY 1993 and their CY 1992 Lobbyists

Schools	Lobbyist	FY93 Earmark $	Purpose
Arizona State University	Advocacy	2,000,000*	Southwest Center for Env. Research Policy (SCERP)
Auburn Univ.	Hogan & Hartson	7,400,000+	National Textile Center
Clark Atlanta University	Cassidy	3,000,000	Hazardous Substance Research Center
Columbia Univ.	Cassidy	10,000,000	Environmental Health Science Research Center
Embry-Riddle	Several1	11,500,000	Engineering and Tech Center
Hahnemann Univ.	Cassidy	10,000,000	Ambulatory Care Facility
Indiana University	Sagamore	10,000,000	Cancer Treatment Facility
Louisiana State University	Hudson, Thomas	10,000,000	Coastal Energy and Environment Resources Center Facility
New Mexico State	Advocacy	2,000,000*	SCERP
Rutgers University	Rogers & Wells	2,600,000	Plant Bioscience Building
Saint Joseph's University	Cassidy	2,300,000	Center for Food Marketing
Tufts University	Cassidy	3,200,000	Center for Environmental Management
U. Alabama, Birmingham	Van Scoyoc	10,000,000	Biomedical Research Build.
Univ. Alaska	Florida Business Assoc.	6,900,000	Airway Science Program
Univ. Detroit Mercy	Cassidy	1,200,000	Center for Excellence in Polymer Science
Univ. of Georgia	Kilpatrick and Cody	700,000	National UV Radiation Monitoring Center
University of Miami	William Roberts and Jordon Schulte & Burchetter	3,500,000@	Southern Oxidants Study
University of Oregon	J. Schafer	1,600,000	Energy Efficient Industrialized Housing
University of South Florida	Advocacy	3,000,000	Intermodal Guideway Public Transit Project
University of Utah	Advocacy	15,000,000	Intermountain Regional Network and Scientific Computation Center
Wake Forest	Schlossberg	3,700,000	Center for Research in Human Nutrition

* Consortia of five U.S. universities: Arizona State, New Mexico State, San Diego State, University of Texas El Paso, University of Utah. They share the $2,000,000 earmark.
+Consortia consisting of Clemson, Georgia Institute of Technology, and North Carolina State.
@Consortia of 125 scientists from 30 schools.
1. Identified lobbyists include Wm. A. Roberts; Sparkman & Cole; Vierra Assoc.; Verner Liipfert Bernhard McPherson & Hand Chtd.

Mr. Cassidy was invited to testify at the Commmittee's June 16, 1993 hearing, "Academic Earmarks." Regrettably, he declined to appear before the Committee. We look forward to a future opportunity to meet with him, as well as others in this rapidly growing field, to discuss their involvement in this enterprise.

The Committee has received testimony that lobbyists are typically on a monthly retainer that varies in a range of from $10,000 to $50,000 per month. Obviously, a ten million dollar award for a hospital greatly offsets a year's billings that would range from $120,000 to $600,000. Missing from Table 6 are schools that may have spent money on a lobbying firm that failed to help them bring home the bacon. Press accounts of academic earmarking focus on the big award winners. One never reads about the untold numbers of other schools that spend significant amounts of money on lobbyists and have nothing to show for the effort. The lack of data on this "failure rate" may actually make the effort to find a lobbyist and pursue an earmark more attractive to schools that are currently on the sidelines.

Agencies' Views of Earmarks

Executive departments do not like academic earmarks. One federal administrator told Committee staff that they viewed such earmarks as a kind of tax the Appropriations Committees imposed on the agency in the process of giving it the other things the agency wanted. As long as the tax rate was relatively low, they could absorb it, but that did not mean they liked it.[13]

Most earmarks, as Senator Byrd has recently pointed out, are not in appropriations bills, rather they are in the reports that accompany the bills.[14] As such, they are not legally binding on an agency. However, executive branch employees told Committee staff that they never ignore such report language and treat it, for all practical purposes, just as if it was the law. Why? Because failure to do so would incur the wrath of the Appropriations Committees, and that is not a price any executive department is fully willing to pay.

Among the executive branch agencies there appear to be two strategies for dealing with earmarked projects: "high touch" and "hands off." The high touch approach, which seems to mark NASA, DOD and EPA as well as DOE's work on research earmarks, requires enormous staff time on the part of the agency to work with the lucky winner to prepare a grant proposal that holds out the promise of actually doing work the agency might conceivably be able to use.

For example, NASA managers express real admiration for the commitment by the President of Wheeling Jesuit College to build a great "Classroom of the

Future" program.[15] However, NASA did not propose a "Classroom of the Future" program; this program was created and imposed upon the agency by the Appropriations Committees. Further, despite the strong leadership in charge of this project at Wheeling, NASA is in no position to verify that the faculty charged with actually carrying out the program will be capable of doing the work. Finally, this program, to the degree it holds promise, is as much a result of NASA prodding and guiding Wheeling as it is due to a commitment by Wheeling's leadership to build a solid program.

Another example is the way EPA has worked with a school in the northeast to shape an environmental studies center. In correspondence with this Committee, that school describes its program as a "model relationship" between the school and EPA. It is certainly that: but it may be a model for how EPA was able to make a silk purse from a sow's ear when saddled with an earmark. EPA has compelled the school to enter into a cooperative research and development agreement, has pushed for peer review, retains the ability to veto research proposals, attempts to make researchers find an EPA official willing to act as a technical adviser to try to make the research more relevant to EPA's needs. All of these steps, first worked out by EPA with this school, are now routinely used by EPA in dealing with research earmarks.[16]

The second approach can be described as hands off. This approach, used primarily by DOE for earmarked facilities construction, essentially rests on the agency simply passing the money on to the earmark recipient. While formal grant proposals are submitted to the agency, the agency does not invest huge amounts of resources in working with the recipient to shape the facility. Basically, they cut the check.[17]

It is hard to fault an agency for simply cutting a check. Staff is stretched thin just attending to the programs which are directed by the President, authorized by Congress and central to the agency's mission. Even when staff can work with an earmark recipient, there is often little pay-off from the effort in terms of helping the agency meet national needs. At the same time, we expect these agencies to be responsible stewards of taxpayer dollars and get as much bang for every buck as they possibly can. Anyone who doubts the commitment of our civil servants should spend a few minutes talking to program officers who have been struggling to find a way to get something worthwhile out of an academic earmark.

It is an illusion that these earmarks make no difference, that they cost little to an Agency. For example, during the four years that the Department of Energy spent $171.8 million on hospitals, the Superconducting Super Collider's appropriations were falling $282 million short of its baseline budget. DOE hospital earmarks alone are equal to 60% of the shortfalls on SSC funding.

This underfunding led to schedule slips that, regrettably, contributed to the erosion of support for the project in the House of Representatives.

Agency officials told Committee staff that earmarks are looming larger and larger in their programs. There was a time when earmarks tended to be "add-ons" over and above an agency's request for a program. However, with budgets flat or nearly so, earmarks now tend to hit directly at the funding base for agency programs. Academic earmarks strike at the heart of Executive departments' abilities to respond in intelligent ways to pressing national needs.

Agencies do sometimes struggle a little against the directives of the Appropriations Committees. For example, DOE attempted in two different fiscal years to have funds for earmarks rescinded. These earmarks are reproduced in Table 7 below. However, the Appropriations Committees refused to accede to these rescission requests.

Table 7
Department of Energy Rescission Requests, 1987 & 1992

RESCISSION ITEM	DOLLARS
FY 1987	
Energy Conservation	
Tufts University Building	10,000,000
Fossil Energy R&D	
Southern Illinois University Coal Preparatory Research	1,300,000
North Dakota University Research Funding	6,100,000
Energy Supply R&D	
University Projects Center for New Industrial Materials, Iowa State University	6,000,000
Atlanta University Center for Science & Technology	7,500,000
Energy Research Complex, University of South Carolina	16,300,000
Center for Science & Engineering, Arizona State University	5,000,000
Center for Nuclear Imaging Research, University of Alabama	12,300,000
St. Christophers Hospital for Children, Philadelphia	14,800,000
Indiana University	3,800,000
Institute of Nuclear Medicine in New Jersey	3,000,000
1992	
Energy Supply R&D	
Upgrade and Operate University Research Reactors	1,000,000
Oregon Health Sciences University	10,000,000
Loma Linda University Medical Center	10,000,000
Total	112,100,000

Source: Department of Energy.

A Profile of the Forty-Eight Responses

Chairman Brown's February 9, 1993 letter asked several questions about the nature of the project which received a 1993 earmark, what kind of peer review the program received and whether the program was authorized. The responses reveal an amazing amount of confusion about what peer review is and what it means to have an "authorized" program, a point that we would have hoped most university presidents would remember from their high school civics class.

Many responses to questions about peer review claimed that peer review had been involved in the program. This claim tended to come in two flavors--one for facilities and another for research. On facilities, the responses would emphasize that an outside group had reviewed the bricks and mortar on campus and recommended a new building to replace aging facilities. Then this report would be used to show the school's Appropriations Committee patron how important the facility would be.

Of course there are those who simply discuss the proposal in-house and then turn to their patron for the dollars. For example, one university described a process whereby the Office of the Vice President for Research sets priorities among proposals generated within the university, then this "wish-list" is simply taken to its Congressional delegation in search of support.

With respect to research proposals, many responses indicated that all proposals would be peer reviewed. But if you looked a little closer, you found that the peer review process was not always particularly rigorous. One version of "peer review" was an in-house merit review by the agency providing the earmark. Another variation was that the earmark recipient or the federal agency may farm the proposals out for real peer review, but this was less impressive than it sounds when you learned that the applicants for the money were limited to researchers solely from the earmark recipient.

What both flavors of "peer review" claims fail to reveal is that there is little or no competition in awarding the money nor any weighing of merit of their desired earmark versus other possible uses of the federal money. To the extent peer review exists on research earmarks it comes after the earmark has already been set aside for a select group's exclusive use. To claim that all research proposals are peer reviewed when the money has already been designated for a specific and very narrow set of researchers is akin to winning a hand of poker with marked cards.

The Committee received many affirmative responses to the Chair's question about whether a project had ever been authorized by Congress. However, the reply usually cited an appropriation bill passed by Congress as the source of "authorization." They confused an authorization with Appropriations Committee approval of a program, often cloaked in report language and inserted in a closed door conference.

Beyond this, many responses cited the public testimony before an Appropriations Subcommittee as evidence that their project had been reviewed and approved by Congress. For example, one university provided a copy of testimony by the Chairman of their Department of Medicine, who appeared before an Appropriations Subcommittee in 1988 and testified in support of a Human Genome Center. In fiscal year 1990, the university received $10 million to build this center, but by then it had changed into a Biomedical Research Center and the focus on human genome research had apparently slipped away. In fiscal year 1993, this school received another $10 million to finish this redesigned project.

One of the most common claims from institutions in defense of their earmarks was that they could not find competitive facilities programs. This argument was made quite forcefully by both Indiana University and Oregon Health Sciences University in their responses to Chairman Brown's letter. There is truth in this claim. However, it is worth noting that in 1991 two- and four-year institutions of higher education undertook construction worth more than $5.2 billion. Clearly, the lack of federal funding programs is not entirely inhibiting the ability of our colleges and universities to renew, expand or create facilities.[18]

Further, though we lack a well-funded facilities program at NIH and NSF, the federal government does provide support for facilities through indirect cost charges. These charges totaled almost $1 billion in 1988.[19] The university referred to above that is building a Biomedical Research facility received more than $91 million in indirect cost payments from Health and Human Services (largely NIH) between fiscal years 1987 and 1992.[20]

Despite indirect cost support as well as other sources of private and public funding, numerous studies by NSF and NIH have documented a facilities crisis in higher education. The solution to this crisis will not be found by relying on earmarks for schools with well-paid lobbyists or friends on the Appropriations Committees. The nation's interest is not well served when funds that could go to properly authorized, competitively awarded, peer reviewed grants are assigned to unauthorized and unreviewed building projects (especially if it is a project that falls well outside the legitimate needs or missions of the funding agency).

One answer to the facilities crisis is to establish competitively awarded facilities funding programs. In fact, the Science, Space, and Technology Committee has been working to do just that at the National Science Foundation. The NSF Research Facilities Program was authorized beginning in fiscal year 1989. It is designed to provide competitive grants with a 50% cost share, a maximum award of $7 million and with directions to the Director of NSF to give priority to institutions that have not received facilities funding from the federal government during the prior five years. The program also sets aside 12% of the funds for Historically Black Colleges and Universities and for other institutions whose enrollments include a substantial percentage of minorities.

Unfortunately, this program has never been adequately funded by the Appropriations Committees (see Table 8). While the Appropriations Committees earmarked hundreds of millions in 1993 alone to build facilities, they have only found $93.5 million in total for the entire five years the NSF facilities program has been authorized.

Table 8
Funding History for the NSF Research Facilities Program
(dollars in millions)

FY	Authorization (millions of $)	Appropriations (millions of $)
1989	$80	$0
1990	$125	$19
1991	$188	$20.5
1992	$250	$16.5
1993	$250	$37.5
Totals	$893	$93.5

Source: SS&T Staff.

Note that the facilities program requires 50% in matching funds. This stands in stark contrast to the practice with earmarked facilities. Three examples demonstrate how earmarked dollars fail to provide the financial leverage we normally require in authorized programs.

Example 1: A university received a $15 million earmark in 1993 for their scientific computation center; that represents 100% of the estimated costs for the project.

Example 2: The small two-year college referred to above received 100% of the costs of its new planetarium (save a $300,000 lot being contributed for the site by a local community).

Example 3: A state university's Marine Science Center received a $500,000 planning grant for a new satellite receiving/processing center intended for a distance learning program. This is just the buy-in figure. According to correspondence with this Committee, the university expects NASA to be instructed by another earmark to provide approximately $5 million to actually build the facility.

While many of the projects reviewed by the Committee promise to match or more than match the federal earmark, the fact is that there is no check on the way federal dollars will be allocated or matched. For example, the university that is building a Biomedical Research facility referred to above originally told Congress that the total cost of their medical facility would be $25 million and that the State would match the federal contribution at the rate of two dollars for every dollar spent by the Department of Energy. However, the new facility ended up costing $36 million and the federal share was $19.4 million, or 54% of the total cost--far below the promised state match.

Because there is no guarantee that costs will stay flat or that a project will get all of its matching funds, there is no guarantee that the earmarked federal dollars will be efficiently leveraged so that the costs of a project are not borne entirely by the federal government. As the example of the Biomedical Research facility makes clear, plans change and costs increase, and there is no way of insuring that the federal taxpayer won't become the funder of last resort.

Conclusions

In a time of static or decreasing federal research budgets, we must spend our scarce resources as efficiently as possible. Relying on earmarks to distribute research moneys guarantees that such efficiencies will be lost. While some of the projects reviewed for this report are broadly in line with national priorities, grave concerns remain about how those proposals stand relative to alternative investments for that money. Basically, earmarks are the result of an academic institution using its special access to an influential Member of Congress (with access often facilitated by a high-paid lobbyist) using this advantage to gain a cash award without having to compete for the money or bear public scrutiny. The government and the taxpayer are the real losers as a result of this practice.

If earmarking continues to grow as it has in recent years, academic earmarks will total approximately $1.7 billion (in 1993 dollars) in the year 2000 for a total of $9.3 billion for the period of 1993 to 2000. Earmarks are already seeping into every agency's research and facilities program. Growth in earmarking will further compromise these agencies' efforts to meet real national needs.

The efforts of the Administration, Congressional authorizing committees, and the academic communities to set research priorities for the nation will run aground on the shoals of earmarking. Politics as usual, in its most self-serving form, will destroy this collective effort to insure that our research agenda meets priority needs and invests our scarce resources wisely.

All of the authorizing committees in the House stand in danger of losing control over the agencies they ostensibly oversee. Armed Services, Energy and Commerce, Agriculture, Public Works and Transportation, Natural Resources and Merchant Marine and Fisheries should share this Committee's interest in seeing that the Appropriations Committees do not unilaterally redirect the research and development funds of agencies under these Committees' jurisdictions. Yet earmarking, especially at its current rate of increase, threatens to do just that. This situation erodes the House's own system of checks and balances. So long as the Appropriations Committees are able to direct appropriated dollars to projects chosen solely on the basis of the location of those projects and without any authorization, the power and purpose of authorizing committees are endangered.

All of the problems with the way academic earmarks are handled can be found in the effort led by Chairman Brown in September, 1992 to strip ten earmarks out of the Energy and Water Appropriations report. The House-passed Energy and Water Appropriation bill had no funding for ten earmarked academic projects. The Senate-passed version of the bill had only $300,000 for studies. Even so, the conference report came back to the House with $95 million for ten specific academic projects. There was little or no public record on these ten facilities, several of which seemed to involve activities completely outside the mission of the Department of Energy. Science Committee Members led a fight on the House Floor against the ten earmarks, and by an overwhelming vote (250-104) the House agreed to convert the academic earmarks into a merit-reviewed facilities program in which all colleges and universities would be eligible to participate.

Despite the express will of the House, just three weeks later the Defense Appropriations conference report included language appropriating fund for the ten projects that had been struck from the Energy and Water Appropriation. These earmarks were protected by a rule which prevented separate consideration of the language specifying the earmarks. Opponents, again led by Science Committee Members, attempted to defeat the rule protecting that language, but fell approximately fifty votes short. Defeating a rule is always a difficult challenge; it was especially difficult in this instance because it was the last day of the Congress. (The complete text of the floor debates on these earmarks is attached to the end of this report.)

This saga seems to exemplify the worst aspects of the way academic earmarks are made: The ten projects were inserted surreptitiously in conference; they were very expensive; they seemed to have little to do with legitimate DOE functions; very scanty information on the projects was available to Congress; none of the projects were specifically authorized. Even worse, though the House rejected the earmarks by a two to one margin, they were reinserted by the Appropriations Committees in another, completely unrelated conference report an hour or two before floor consideration on the last day the Congress was in session. This story also highlights the need for reforms in House rules if we are ever going to get academic earmarking under control.

The following interim recommendations are steps towards ending the wasteful and inequitable practice of academic earmarking. The first set of recommendations would reform House rules to help right the balance between the House and Senate, authorizers and appropriators. The second set of recommendations are aimed at what agencies and Congressional authorizing committees should do until House rules can be changed. The final recommendation is for well-funded, competitive facilities programs.

1. Changing House Rules

- Prohibit unauthorized location-specific earmarks in Appropriations bills and reports. We could protect the scientific peer review process (and reflect well on the integrity of the appropriations process and on the institution as a whole) if the Rules of the House of Representatives made it more difficult to include unauthorized, location-specific research earmarks in Appropriations bills. The Rules should be changed to provide that a point of order will be sustained against any provision which designates a particular institution as a recipient of research funds unless that project was previously authorized by law.

- Amend House Rule XX(2) so that managers for the House cannot request a waiver of points of order against Senate legislative amendments without the agreement of the Chairs of appropriate authorizing committees. Currently, conference reports often come back to the House containing substantive legislation added by the Senate which, under the House's own rules, could not be included by the House in the appropriations bill. This procedure effectively cedes legislative authority to the Senate and bypasses the House authorization process entirely. In cases where House managers then seek a rule from Rules Committee that waives all points of order, the powers of House authorizing committees are vitiated.

2. Steps to Take Until New Rules are in Place

- All authorization bills should include language which will prohibit agencies from obligating funds which have been appropriated, but not authorized. The Science, Space, and Technology Committee is currently considering such language and we would encourage other authorizing committees to adopt similar provisions.

- Agencies must say no to earmarked appropriations that are in report language. Report language earmarks are not binding in law and agencies must make a strong effort to refuse to waste scarce resources on unauthorized projects. Executive agencies should work with their authorizing committees in developing a mechanism for reprogramming or rescinding these moneys. This requires that authorizing committee Chairs fully support the agency's efforts.

3. Competitive Facilities Programs

- Robust, well-funded, competitively awarded facilities programs at NSF and NIH would undermine the justification for academic facilities earmarks. The Appropriations Committees should fund the NSF facilities program at its fully authorized level. Those schools which have been seeking earmarks for themselves based on the claim that no competitive facilities programs exist should ask their patrons on the Appropriations Committees to fully fund these competitive programs.

There are certainly more difficult and dangerous problems facing the federal government than academic earmarking. But with limited financial resources on the one hand and great national needs on the other, we cannot afford to turn a blind eye to a practice that is now redirecting three-quarters of a billion dollars annually from real needs to projects whose funding is based on parochial interests. This is especially disturbing because these funds should be invested wisely in the most promising research programs and emerging technologies--the very heart of our nation's future economic vitality.

Fortunately, this is a problem that we can solve right here in Congress. We hope that our colleagues in the House and Senate, as well as our friends in academe and the public at large, will help put an end to the practice of academic earmarks.

Attachments:
1. Text of the floor debate on cutting academic earmarks from the FY 1993 Energy and Water Appropriations bill.
2. Tables summarizing information compiled by SS&T staff on the fifty schools Chairman Brown wrote to.
*

Endnotes

[1]. All of these references are derived from the Oxford English Dictionary entry on "earmark." The quote is from Richard Carpenter, The Soules Sentinel. Note that another meaning of the term was the notching of the ears of criminals so that they would be readily recognizable among the populace. The National Pork Producers Council confirmed that a group of hogs is a "herd".

[2]. Note that the trend in recent years has been for earmarks to grow in number and size. This practice has moved from being a minor annoyance to a real problem that threatens other research efforts. Earmarks can have an ambiguous quality. For example, schools that are members of consortia that receive earmarks will often deny that they themselves are beneficiaries of earmarking. In other cases, a school can point to an authorization that endorses funding their work. This was the case with Lamar University's Gulf Coast Hazardous Substance Research Center, which they note was authorized in the 1986 Superfund Reauthorization. In those cases where a school or consortia have a legitimate authorization, the Committee does not consider that to be an improper earmark.

[3]. Numbers provided to staff by the National Center for Education Statistics, Department of Education.

[4]. The number of schools identified as earmark institutions in 1992 is difficult to identify with complete confidence. For example, many of the earmarks are for consortia whose membership is not easy to pin down. The figure 170, which is an approximate number, is cited in the CRS study, "Trends in the Distribution of Apparent Academic Earmarks in the Federal Government's FY 1980-92 Appropriations Bill," September, 1992.

[5]. Academic earmarking seems to have "taken-off" in the wake of Columbia and Catholic University hiring Cassidy and Associates in 1983 to help them win earmarks. It is more than simply hyperbole to refer to the 1980-1992 compiled data as an "all-time" list because, effectively, academic earmarking was a fairly rare practice prior to the early 1980s. Testimony from the first hearing and interview with DOE officials.

[6]. Peterson's Guide to Two Year Colleges, 1992. We also had a member of the staff call the school to confirm that there were no majors in Astronomy or Physics. There are no such majors, but the college does offer one introductory astronomy class and a full year of introductory physics.

[7]. Interview by Science Committee staff of Department of Transportation staff. The source of this pressure was not Congress so much as schools that were in the program or wanted to get into the program.

[8]. Department of Transportation Inspector General report number AV-FA-3-010, "Report of the Audit of Federal Aviation Administration Sponsored Higher Education Programs," May 19, 1993, p. 23.

[9]. Department of Transportation Inspector General's report, p. 14.

[10]. Department of Transportation Inspector General's report, p. 15.

[11]. Department of Transportation Inspector General's report, p. 23.

[12]. To give credit where credit is due, SS&T staff have seen draft language in the report accompanying the House Transportation Appropriation recommending that funding for this program be terminated.

[13]. Specifically, they told staff that earmarks were the one percent tax the agency had to pay to get the other ninety-nine percent of the things they needed. In preparing this report, staff received briefings and interviewed officials from the Department of Defense, Department of Energy, Department of Transportation, National Aeronautics and Space Administration and the Environmental Protection Agency.

[14]. Senator Robert Byrd, "Line-Item Veto," Congressional Record, Wednesday, May 5, 1993, S 5478. Senator Byrd said, in speaking against an enhanced rescission proposal, that, "I have read with great amusement all the scenarios about why Senator Byrd opposes the line-item veto. It would get in the way of his ability to earmark appropriations for West Virginia, some have said. These are amusing scenarios that people who see spooks behind every shadow are very able to come up with. But they do not know the legislative process. Most of the earmarking is done in committee reports, not in the appropriations bills themselves."

[15]. NASA managers also laud the director hired to head up this program.

[16]. Staff interview of EPA program officers.

[17]. NASA seems to be adopting a similar approach with some of the earmarks that they were required to fund in FY1993. The more buildings they are told to pay for that have nothing to do with the agency's mission the less hope the agency will have of being able to salvage something through a high touch approach. NASA has only begun to be drawn into the earmarking game in the last three years so that they don't have as much institutional history as DOE does in dealing with earmarks.

[18]. Figures on total construction are derived from a presentation by Paul Abramson, Editorial Director, American School and University, at the 1992 Association of Physical Plant Administrators of Universities and Colleges, Indianapolis, IN.

[19]. Budget of the United States Government, Fiscal Year 1993, Part I, page 136.

[20]. Data provided by the National Institutes of Health.

"SEC. 206. Subsection (a) of section 7 of the Federal Water Project Recreation Act (79 Stat. 216 16 U.S.C. 460l-18) is amended by deleting, the Proviso from the first sentence and by changing the colon after the word "purposes" to a period.".

The SPEAKER pro tempore. The question is on the motion offered by the gentleman from Alabama [Mr. BEVILL].

The motion was agreed to.

The SPEAKER pro tempore. The Clerk will designate the next amendment in disagreement.

The text of the amendment is as follows:

Senate Amendment No. 36: Page 32, after line 13, insert:

"SEC. 207. Utilizing processes required under the National Environmental Policy Act, the Secretary of the Interior is directed to conduct a formal analysis, by no later than March 31, 1994, of alternatives for the design, construction, and operation of the Sykeston Canal as a functional replacement for Lonetree Reservoir, pursuant to section 8(a)(1) of Public Law 89-108, as amended by the Garrison Diversion Reformulation Act of 1986, Public Law 99-294. The resulting Definite Plan Report/Environmental Impact Statement shall be utilized by the Secretary for the development of a Record of Decision which is to contain the Secretary's recommendation for proceeding with the final design and construction of the Sykeston Canal, consistent with the provisions of the Garrison Diversion Reformulation Act, the National Environmental Policy Act, the Endangered Species Act, the Fish and Wildlife Coordination Act, and the Boundary Waters Treaty of 1909. For purposes of this section, the Secretary shall take into account the results of studies conducted by the Secretary of the Army with respect to the stabilization of Devils Lake, North Dakota.".

MOTION OFFERED BY MR. BEVILL

Mr. BEVILL. Mr. Speaker, I offer a motion.

The SPEAKER pro tempore. The Clerk will designate the motion.

The text of the motion is as follows:

Mr. BEVILL moves that the House recede from its disagreement to the amendment of the Senate numbered 36, and concur therein.

The SPEAKER pro tempore. The question is on the motion offered by the gentleman from Alabama [Mr. BEVILL].

The motion was agreed to.

The SPEAKER pro tempore. The Clerk will designate the next amendment in disagreement.

The text of the amendment is as follows:

Senate Amendment No. 37: Page 33, line 4, strike out all after "only)." down to and including "research" in line 9 and insert "$2,971,583,000, to remain available until expended, of which $300,000 shall be available only for planning funds for the Bishop Science Center, State of Hawaii; the Ambulatory Research and Education Building, Oregon Health Sciences University; and the Center for Energy and Environmental Resources, Louisiana State University, Baton Rouge, Louisiana, and of which $4,000,000 shall be derived by transfer from the Geothermal Resources Development Fund".

MOTION OFFERED BY MR. BEVILL

Mr. BEVILL. Mr. Speaker, I offer a motion.

The SPEAKER pro tempore. The Clerk will designate the motion.

The text of the motion is as follows:

Mr. BEVILL moves that the House recede from its disagreement to the amendment of the Senate numbered 37 and concur therein with an amendment, as follows: In lieu of the matter stricken and inserted by said amendment, insert "$3,015,793,000 to remain available until expended, of which $94,800,000 shall be available only for the Bishop Science Center, State of Hawaii; the Ambulatory Research and Education Building, Oregon Health Sciences University; the Center for Energy and Environmental Resources, Louisiana State University, Baton Rouge, Louisiana; the Advanced Technologies Institute, University of Connecticut; the Biomedical Research Facility, University of Alabama at Birmingham; the Cancer Treatment Facility for the Indiana University School of Medicine at Indianapolis, Indiana; the Cancer Institute of New Jersey; the Northeast Environmental Resource and Renewal Facility, Mayfield, Pennsylvania; Center for Advanced Industrial Process, Washington State University, Washington; and the Hahnemann University Ambulatory Care and Teaching Center in Philadelphia, Pennsylvania.".

Mr. BROWN. Mr. Speaker, I am opposed to the motion and I ask for 20 minutes of the time allotted for debate.

.The SPEAKER pro tempore (Mr. COX of Illinois). Is the gentleman from Indiana [Mr. MYERS] opposed to the motion?

Mr. MYERS of Indiana. Mr. Speaker, I am not opposed.

The SPEAKER pro tempore. The gentleman from Alabama [Mr. BEVILL] will be recognized for 20 minutes, the gentleman from California [Mr. BROWN] will be recognized for 20 minutes, and the gentleman from Indiana [Mr. MYERS] will be recognized for 20 minutes.

The Chair recognizes the gentleman from Alabama [Mr. BEVILL].

Mr. BEVILL. Mr. Speaker, I reserve the balance of my time.

The SPEAKER pro tempore. The Chair recognizes the gentleman from California [Mr. BROWN].

Mr. BROWN. Mr. Speaker, may I say at the outset that I am profoundly apologetic to my good friends, the gentleman from Alabama [Mr. BEVILL] and the gentleman from Indiana [Mr. MYERS] for interrupting the smooth flow of this legislation.

As I indicated earlier during general debate, I support this bill and the conference report.

I have, of course, an understanding that it represents a compromise in many ways, but on this particular issue, represented by amendment No. 37, I have been making a personal crusade for a number of years to change the situation, and I will explain what is represented here.

I do not feel in good conscience that I can let this amendment in this bill go through without making it clear to all the Members why I am opposed to this particular amendment. I beg the indulgence of my friends for doing this. I recognize that the hour is late and they desire to go home and this troubles me, but I want to make clear the position I am taking here.

Mr. Speaker, this is the language of the amendment which Chairman BEVILL's motion proposes to accept. It is that $94,800,000 shall be available—of a larger $3 billion item—shall be available only for the Bishop Science Center, State of Hawaii; the Ambulatory Research and Education Building, Oregon Health Sciences University; the Center for Energy and Environmental Resources, Louisiana State University, Baton Rouge, LA; the Advanced Technologies Institute, University of Connecticut; the Biomedical Research Facility, University of Alabama; the Cancer Treatment Facility for the Indiana University School of Medicine at Indianapolis; the Cancer Institute of New Jersey; the Northeast Environmental Resource and Renewal Facility, Mayfield, PA; the Center for Advanced Industrial Process, Washington State University; and the Hahnemann University Ambulatory Care and Teaching Center in Philadelphia.

With a minor exception or two, each of these is allocated $10 million. In the House-passed bill, there was no money for any of these. In the Senate-passed bill, there was only $300,000 to study them. In the conference report, that $300,000 study has grown to the figure that I mentioned, $94,800,000 for 10 carefully described projects scattered throughout the United States.

It is this process by which unreviewed, unrequested projects are inserted into the conference that I have been objecting to for years without avail. It is such a serious matter that I have even proposed to the various committees studying the rules of the House that we revise the rules of the House to make this more difficult.

Now, I understand why they are in there. Somebody requested them. Most of those somebodies were on the Appropriations Committee.

They are worthy projects. I am not arguing with the merits of them, but nobody has reviewed the merits of them, except the person who suggested them to the appropriations conference committee.

They did not come up in the original bill in either House, as I have indicated before.

Mr. Speaker, this process is wrong. This process denies the Members of the House who are not on the Appropriations Committee any opportunity to secure worthy projects through the normal processes of authorization, peer review and so on.

Now, I know that many times those of us on authorization committees go to the Appropriations Committee and ask them to do things like this. I have been guilty of it myself. None of us are without sin; but to refuse to confront the reality that this is a distortion of the democratic process is wrong.

I think the only way I can make that point is to do what I am doing here today. I apologize again for delaying this bill, but I think it is absolutely essential that we do this.

Now, I would be happy at this point to recognize any other sinner who would like to confess and take a few moments of time on this matter.

Mr. FAWELL. Mr. Speaker, will the gentleman yield?

Mr. BROWN. Mr. Speaker, I yield 3 minutes to the gentleman from Illinois [Mr. FAWELL].

Mr. FAWELL. Mr. Speaker, I commend the gentleman from California very much.

What we have here is $34.8 million of the taxpayers' money being added and appropriated by a conference committee for 10 new—and it is described this way—energy, educational and/or medical facilities, when neither the House nor the Senate bill which went into conference contained any such appropriations.

Now, obviously no authorizing committee ever reviewed them, or so far as I know, no authorizing committee has ever even heard of these 10 new building projects or facilities. Nobody really knows specifically what they are about. There has been no peer review, no competitive bidding, and especially in science and technology this, I think, is where we should certainly draw the line.

Mr. Speaker, we do have pork that has creeped in; yet the taxpayers are expected to pay for them without the rest of Congress even knowing what the specific kinds of facilities are that are being purchased, or their respective merits.

Officeholders of any local government will be run out of town if they tried this kind of irresponsible behavior. I am a former attorney of many local taxing districts. It is just unheard of that you would take the taxpayers' money and at the last minute in a conference committee where neither bill had any mention of any such construction projects or facilities, whatever they are, and then to plug them in at the last minute and expect the rest of us to accept it, especially at this time in the history of this Nation. I am not going to go over all the problems of the deficit. We're all aware of the burgeoning $4 trillion debt.

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But for the conference committee to add these appropriations at this time I think would be terribly unreasonable, and the people of this Nation certainly will have a right, once again, to chalk up a good grievance against this body.

Now I defer, certainly, to the gentleman from California [Mr. BROWN]. He is the chairman of the Committee on Science, Space, and Technology. I, frankly, had hoped he would have presented an amendment that would simply delete all of these appropriations altogether, and the gentleman, in his good nature and the sound person that he is, has suggested that, well, the money will still be appropriated, but it will go on the basis of peer review, on the basis of authorization, and on the basis of study and competitive bidding, via the authorizing committees of this body and if not the appropriations—totaling $94.8 million will simply lapse.

Well, if we are going to spend that kind of money, that is the way it ought to be, and this is no attack upon the projects themselves. Maybe they will live up to, and survive the regular committee process, and ultimately be approved.

Mr. BROWN. Mr. Speaker, the gentleman from Illinois [Mr. FAWELL] raised a subject that I neglected to cover in my initial remarks.

Procedurally, Mr. Speaker, it is necessary, under these circumstances, as I understand it, and I ask for a correction if I am wrong, to defeat the chairman's, the gentleman from Alabama [Mr. BEVILL], motion for the previous question when we complete this debate in order that I may offer a motion to amend, and my motion to amend will not strike the money, although the gentleman from Illinois [Mr. FAWELL] indicated that he would have preferred that. It will merely have the following language. It will strike all of the earmarks and insert in lieu thereof: Making competitive merit review awards to academic research facilities to the extent otherwise authorized by law.

In other words, Mr. Speaker, the money remains, the projects can go forward, if they are authorized and peer reviewed, and the overall amount of money in the bill will remain the same.

Now I think that was the least difficult, most positive way to deal with this problem, and I hope that the chairman in his generosity would accept this amendment. But I doubt he will.

Mr. Speaker, I yield 2 minutes to the gentleman from Pennsylvania [Mr. WALKER].

Mr. WALKER. Mr. Speaker, I thank the gentleman from California [Mr. BROWN] for yielding this time to me.

Mr. Speaker, this is actually a pretty good bill overall. It is within the President's spending limit, and it is having good effect on the Congress to deal with that kind of thing. It also follows the House authorization on energy R&D priorities fairly honestly, with the exception of the amendment we are dealing with here. It provides a critical boost for some hydrogen research which I think is one of the energies of the future, and I think that is a good thing. It funds some important futuristic programs like SP-100 and some others, and, as a matter of fact, the bill is, in my mind, good enough.

Mr. Speaker, I voted for it. I do not vote for many bills of this type, and I voted for this one. It is kind of unusual. But I will tell my colleagues that I think the moderate approach which the gentleman from California [Mr. BROWN] has taken on this particular amendment is exactly right.

What we have here is another process where, not only have they authorized a bunch of projects and appropriated the money at the same time without any kind of review of those projects, but they have also taken the bill well out of scope.

Now this bill is about, in this particular section, $150 million out of scope because of the additions that were put in in the conference. We have projects that are not authorized. We have had no hearings on these projects in our committee, or in any committee, authorizing committee. Some of us have never even heard of these projects. We do not know if they are good projects or not. We are going to spend $95 million for some projects that seem to have as their main merit that somebody on the conference committee got $10 million for their project, and everybody else took $10 million for theirs.

Mr. Speaker, that is not the way to get good science done in this country, and I would suggest that the chairman, the gentleman from California [Mr. BROWN], has given us the right approach. What he is saying is, "Let's keep the money. Let's say that the money should go for good projects. But let's make certain the projects are good by having them reviewed. Let's have an authorization project where they get reviewed, or let's have a merit review process. But let's make certain that the $95 million that we're spending for these projects buys us good projects."

Mr. Speaker, we have no assurance of that here this evening. Support Chairman BROWN. He is going in the right direction.

Mr. BROWN. Mr. Speaker, I think I understand the tactics of the gentleman from Alabama [Mr. BEVILL] and the gentleman from Indiana [Mr. MYERS]. I understand their desire to move the bill as quickly as possible and to use the minimum amount of time that they desire. And of course I would like to cooperate with them on this in every way that I can.

I am not anxious to delay this either, but I would like to have every Member here clear as to the procedure, and, after I clarify that, I will yield to the gentleman from Minnesota [Mr. PENNY] for a brief time.

In order to get to my amendment, Mr. Speaker, it will be necessary to defeat a motion for the previous question on the amendment before us offered by the gentleman from Alabama, and I am, therefore, requesting all of the Members to vote "no" on the previous question. If the previous question is defeated, I will then offer my amendment, not to strike the money, but merely to say that the specific earmarks are removed and the funds will be allocated according to a peer review process.

Mr. Speaker, I want that to be clear in the minds of all the Members.

Mr. Speaker, I yield 1 minute to the distinguished gentleman from Minnesota [Mr. PENNY].

Mr. PENNY. Mr. Speaker, this is a classic example of pork barrel spendng. Items show up in a conference report that were not specifically funded, neither in the House, nor the Senate, version of this legislation. The gentleman from California [Mr. BROWN] has eloquently made the case for striking these projects. Voters want their elected leaders to stop with politics as usual. I understand not even one of the conference committee members found this particular provision objectionable.

The bottom line, Mr. Speaker, is we should all object to this kind of practice, especially at this time when we are trying to convey to the American public that we are finally taking this deficit more seriously, and for that reason, Mr. Speaker, I would urge support for the motion offered by the gentleman from California [Mr. BROWN].

Mr. BEVILL. Mr. Speaker, I yield 3 minutes to the gentlewoman from Connecticut [Mrs. KENNELLY].

(Mrs. KENNELLY asked and was given permission to revise and extend her remarks.)

Mrs. KENNELLY. Mr. Speaker, I would take issue with the last speaker, the gentleman from Minnesota [Mr. PENNY], and say this is not politics as usual. This is the exact opposite.

I can remember sitting in this hall a year ago when the President gave us his State of the Union message, and he talked about the new world order. He talked about how things had changed, and at that time he thanked the men and women in uniform, as he should, for what they had done to bring about the collapse of the Soviet Union and the end of the cold war. And he also thanked the taxpayers, as he should have, for paying for the weaponry that were deterrents so that we never would have that terrible nuclear war that we so dreaded. But not a word, not anything, no plan, not even a line, let alone a paragraph, about how we were going to deal in this new world order, how we were going to keep our skilled workers, the highly trained individuals who had given their adult life to make these weapons is their life work, and how they would go on to pay the mortgage, to take care of their families, to educate their children.

So, yes, there are some projects in this bill tonight. The gentleman from Alabama [Mr. BEVILL], the chairman, of course would not let projects that were not worthwhile into his bill. Every one of us on both sides of the aisle know that the days of the Lawrence Welk projects are over, pork is over. But we have to begin to fight back to keep our skilled workers employed. Most of these projects are university projects. These are projects, and I will speak to particularly the one that I am interested in Connecticut. I am proud to say I am interested in it for it will retrain our engineers and provide needed high-skill jobs.

Mr. Speaker, Connecticut is a small State, but the fourth State dependent on defense and it made our Nation strong so that we could win that cold war. This project is a precision manufacturing institute, a joint effort of the schools of engineering and business, an institute of materials and science. The goal is to advance precision manufacturing and technology. The Advanced Technology Institute at our University of Connecticut will help the economy of New England rebound through this time of change, but, more importantly, is the only research and development center in Connecticut and one of the few in the Nation.

□ 2000

Mr. Speaker, we have to fight back. We have to keep our trained workers, our skilled workers employed for new challenges. We have to do new and innovative things in high technology so that we will remain and continue to be the Nation that everyone looks to for technology and as a world order. We cannot do it unless we pay for it. We pay for it in this way with university research because we have to go on to excel in high technology and continue as a proud Nation.

Mr. MYERS of Indiana. Mr. Speaker, I yield myself such time as I may consume.

Mr. Speaker, the words "peer review" have been thrown around here rather frequently this evening. What do they mean? How many Members have examined the peer review process we are discussing here?

What it really means is that a group of college presidents, in most cases, or maybe professors, get together and decide among themselves which university will get money. Part of it is corporate money, and I have no objection to the peer review process there. If it is corporate money or privately raised money, of course, they are the ones that should decide where that money goes.

What we are doing here with your money, the taxpayers' money, is deciding that these universities, which may not be one of the 20 or 30 or 40 most prestigious universities in the country, who are standing in need of funds like this to do the job we are providing for here.

Let us look at what this money does. It is not money to operate these facilities. It is construction money to build a facility. The university will then use that peer process to decide what shall be done in those universities in their research. All of the money for these universities is for research.

Let us examine just what this is. We have the environment. Certainly I think every Member here is concerned about the environment. Some may be more than others. But one of these projects is to help study the environment, how we may work and still protect the environment. How we can do a better job to be competitive in the world.

One out of four people in this country living today will personally experience cancer sometime in their life. One out of nine women will experience breast cancer. Those numbers are growing. Heart disease is the largest killer of people in this country, much higher than AIDS and all of these other things. These are things that would be done in one of the university projects.

Cancer has touched everyone in this room either directly through their own family, a very close friend, or some other family member.

Research for things like this is going to make life easier. We do not know the answer yet for cancer. We do not know what causes it. We have found some cures for cancer, fortunately. Some types of cancers can be cured. But not because someone did not make an investment. And this is what we are doing here.

We did not go through this willy-nilly. It is true we did not have any research dollars or any money for these facilities in our bill that passed the House. It was austere. The other body added certain projects.

But we examined these very closely, and we concurred with them. We are arguing today that they should be protected.

Technology transfer. We are still on the leading edge in the world as far as technology and development. Better ways to manufacture, building a better product so that we can be competitive with the rest of the world.

But somehow we do not transfer that technology out to industry or businesses so they can use it. Part of these research dollars will go for technology transfer so that American workers can be competitive in the rest of the world.

The gentleman from Illinois [Mr. FAWELL] mentioned that he would run people out of local government if they did something like this.

I never served in local government, but I have been helping other county commissioners. And if a county commissioner wants to build a new bridge, I do not think he goes to a college professor or a college president to decide where that bridge shall be built or how it shall be built. They have to raise the money; they decide how it is spent. That is exactly what we are doing here.

The word "futuristic" was used by the gentleman from Pennsylvania [Mr. WALKER]. What are we describing here? The future of our children, so we can find jobs for them, so we can protect their health, so we can do the things that we were not able to do. These are the futuristic things that this committee is bringing forth here now, and we have examined them.

To my conservative friends—well, I do not see many of them on the floor right now—but to my conservative friends who are concerned about balancing the budget, we are not saving one penny here.

The amendment of the gentleman from California [Mr. BROWN], our friend, if he is successful, will offer an amendment to keep the money in, but turn the decision over which one of these projects shall be built and where they shall be built to someone else who does not raise the money.

Let us take one last thing here. Back in 1985 20 universities received more than 55 percent of the money through the peer review process. Most of those universities are under examination right now for fraudulent use of the peer process money that they received.

So we are not protecting anything here. If we were, we would all be supporting it. I would certainly be leading the pack here today.

In closing, we are not saying one penny by the amendment of the gentleman from California [Mr. BROWN]. It is going to be spent, except it is going to be spent somewhere else in the country. And some process at some elite college someplace, the same people making the decisions there are controlling where the dollars are going. And it is going to be their universities that get it.

So please support the motion of the gentleman from Alabama [Mr. BEVILL]. That is the proper way to administer the funds that we have here in this program.

Mr. Speaker, I reserve the balance of my time.

Mr. BEVILL. Mr. Speaker, I yield myself such time as I may consume.

Mr. Speaker, I rise in support of my motion and urge a vote for it. I would like to point out that the proposed amendment does not strike the money; it strikes the projects. In other words, what is does is lets the administration decide what to do with the money.

I think Congress ought to make that decision. I think we should make that decision. I do not think we should give that right to someone else.

Mr. Speaker, we hear all about this peer system. I can tell you about the peer system. The late Dr. Frank Rose, the president of the University of Alabama, used to be one of the peers. He told me, "I will tell you how the peer system works. Universities that have the peers are the ones that get the projects, and they are the ones that make the decisions."

I do not think we should pass this out and tell someone else to make the decisions that Congress should make. This is our decision.

The committees of the two houses have agreed on these projects. I know one, the University of Alabama, is to complete a science research building with laboratory equipment. That is the same campus that developed the world's first artificial artery, a plastic artery that made it possible to save thousands and thousands of lives all over the world. This was the first in the world.

I am so glad we did not have at that time, the rule of my good friend, the gentleman from California [Mr. BROWN], which he wants to put in here.

As a matter of fact, this is the process we have followed for over 100 years. There is a good reason for this. Many of the requests that we get on appropriations, come from members of the authorization committees. We receive requests from the chairmen of the authorizing committees for one reason or the other, maybe the other body would not go along with their particular project, they come and say would you put this project on your appropriation bill.

This building is critical to my university.

Certainly that is a one-time expenditure. So we do this. These are projects that do not have an authorization.

Certainly, we go before the Committee on Rules. We go through this. They give us a rule on these matters.

So we are asking Members to let us let this Congress make those decisions. Support your committees. Do not get into this peer business and do not get into this business of letting the administration decide where these projects are going to go.

The money is going to be in here. This does not knock out the money. I just want to call that to the attention of Members.

Mr. Speaker, I would appreciate an aye vote on my motion.

Mr. BROWN. Mr. Speaker, I yield myself such time as I may consume.

Mr. Speaker, I have deliberately refrained in my discussion here from questioning the value of any of these 10 projects. I know that they are very dear to the hearts of the Members who sponsored them. I do not question the motives of any of the Members who have suggested those projects. I regret that the distinguished chairman inadvertently, I am sure, misstated my amendment, which requires that these projects be authorized.

The fundamental law with regard to the Department of Energy states that all appropriations shall be made in accordance with annual authorizations. Annual authorizations are the only way that Members of Congress have a voice in these projects.

My amendment does not turn this over to the department or the administration. It requires that we abide by the law requiring authorizations.

☐ 2010

The gentleman from Alabama [Mr. BEVILL] will point out quite correctly that we have not passed such authorizations recently. I have had long discussions with him and with the distinguished chairman of the counterpart subcommittee in the Senate, suggesting that we cooperate in getting authorizations.

I regret to say that I have been met by a stone wall with regard to that. The distinguished chairman in the other body says it is a prerogative of the Senate in accordance with their rules to do what we see done on this bill.

Now, is it fair to the Congress that of these 10 projects, they go to eight States and that seven of these States have important members on the Committee on Appropriations in either the House or the Senate? Is that allowing the Congress, the Members of the Congress an opportunity to participate in this process?

There is no person I have higher respect for than the distinguished gentleman from Alabama. He is right when he says that he is forced into doing some of the things that he is doing. He did not originate these projects. They were originated largely in the other body.

We have not passed an authorization, but this House passed the Organic Act requiring annual authorizations, and this year passed the Department of Energy bill, which in part came from the committee that I have the honor to chair, which required that there be authorizations.

And the conferees on the other side have refused to agree to that provision in the House-passed bill. The House has spoken. They want authorizations. But we cannot get them for a variety of reasons that we do not need to go into here tonight. But it is not true to say that my amendment proposes to turn this over to anybody except those disenfranchised Members of the House who today have no voice in the way these projects are established.

There is no partisanship in this. I have carefully looked at the names of the Members that I think I can identify with these projects, and they are about half Democrats and half Republicans.

Mr. FAWELL. Mr. Speaker, will the gentleman yield?

Mr. BROWN. I yield to the gentleman from Illinois.

Mr. FAWELL. Mr. Speaker, may I just add one point. I know it is late.

Think of the precedent that we will be setting tonight. We all know what has happened. Some privileged Members sitting on a conference committee feel they can just take these types of liberties with the taxpayers' money, when we do not have the slightest idea as to what it is for. They are not even identified. Everybody gets $10 million except for 2, right down the line. We do not even know if it is the beginning of a big construction project or a little construction project.

If ever we are going to take a stand, it should be here. We are not going to take the money away. We only say, use the rules of the Congress, some semblance of fairness.

Do not set a precedent where we just simple say, "This can happen, every conference committee, don't worry, you can break the rules of relevancy or whatever," and come back and expect us to put a stamp on it.

Congress has to stand up once in a while and say, "No, we will not stand for this."

Mr. BROWN. Mr. Speaker, let me conclude by repeating what I just said. We are not turning over our responsibilities to anybody else. We are redeeming our responsibilities as equal Members of the House of Representatives and demanding that we have a voice provided by laws that we have passed, to have a voice in what is going on on this matter.

It is not trivial. This has been going on over a decade. The total amount of earmarks in the annual appropriations is not just this $95 million. It approaches a half a billion dollars or more.

It is truly significant. It is truly important that we as individual Members of this House have a voice in how the taxpayers' money is spent and that it be spent in order to achieve the public objectives as determined by the public's representatives.

I ask for a "no" vote on the motion to terminate debate and a "yes" vote on my amendment.

Mr. MYERS of Indiana. Mr. Speaker, I yield myself such time as I may consume.

Listening to the arguments, I have come to the conclusion there is just one question here: Who constitutes the peer? Was it this committee or some other committee of this Congress? That is the only argument we have here tonight.

Members of this committee were elected by the people, just like the authorizing committees are. We have used our judgment. We have examined them, same as the authorizing committees.

We never criticize the authorizing committees. I understand the peer question they raise here tonight. I think we all do. But that is an old issue.

Mr. Speaker, I yield back the balance of my time.

Mr. BEVILL. Mr. Speaker, I yield myself such time as I may consume.

I am not going to use all my time. I just want to urge my colleagues to vote aye on my motion.

We have this come up frequently. We work with the authorization committees. We do get a vote on this. The rules require a vote. We want a vote. We want our colleagues to vote on it. We are not trying to slip anything through.

The other body is going to vote on it. So nobody is getting harmed. But the authorization committees, for one reason or another, frequently, do not pass an authorization bill that reaches the President's desk.

We have projects that we need throughout the country. We cannot sit back and let only the peers decide what we need.

I am just telling my colleagues, that system does not work. It is up to them. This is their vote. This is their privilege, and it should be. Nobody wants anything slipped through without their vote.

I just think that we ought to give a chance to those young men and women, those bright young men and women out there that want to go into science. Let us not discourage it. Let us encourage them and furnish them the labs and the places to work. This is what it is all about.

Every one of these projects is related to and part of the lab work in this country. We need these projects.

I urge my colleagues to vote aye on my motion.

Mr. Speaker, I yield back the balance of my time, and I move the previous question on the motion.

The previous question was ordered.

The SPEAKER pro tempore (Mr. COX of Illinois). The question is on ordering the previous question.

The question was taken; and the Speaker pro tempore announced that the noes appeared to have it.

Mr. BEVILL. Mr. Speaker, I object to the vote on the ground that a quorum is not present and make the point of order that quorum is not present.

The SPEAKER pro tempore. Evidently a quorum is not present. The Sergeant at Arms will notify absent Members.

The vote was taken by electronic device, and there were—yeas 157, nays 203, not voting 72, as follows:

[Roll No. 400]

YEAS—157

Abercrombie
Ackerman
Anderson
Andrews (NJ)
Applegate
Baker
Barton
Bateman
Bentley
Berman
Bevill
Bilbray
Bliley
Bonior
Borski
Boucher
Brooks
Browder
Bryant
Bustamante
Callahan
Carr
Chapman
Clement
Coleman (TX)
Coughlin
Coyne
Cramer
de la Garza
DeFazio
DeLauro
DeLay
Derrick
Dicks
Dingell
Dixon
Downey
Dwyer
Dymally
Eckart
Edwards (TX)
Erdreich
Fazio
Foglietta
Ford (MI)
Franks (CT)
Frost
Gallo
Gejdenson
Gonzalez
Hall (OH)
Hamilton
Hammerschmidt
Harris
Hefner
Hertel
Hoagland
Hobson
Hochbrueckner
Houghton
Hoyer
Hughes
Jefferson
Jontz
Kanjorski
Kaptur
Kennelly
Kildee
Kleczka
Kolbe
Kolter
Kopetski
LaFalce
Lancaster
Lantos
Laughlin
Lehman (CA)
Lewis (CA)
Lightfoot
Livingston
Lloyd
Long
Lowey (NY)
Matsui
Mazzoli
McCloskey
McDade
McHugh
McNulty
Michel
Miller (OH)
Mineta
Mink
Moakley
Mollohan
Montgomery
Morrison
Murtha
Myers
Nagle
Natcher
Neal (NC)
Nowak
Oakar
Oberstar
Obey
Olin
Ortiz
Pallone
Panetta
Parker
Payne (NJ)
Pelosi
Perkins
Peterson (FL)
Peterson (MN)
Pickett
Price
Pursell
Quillen
Rahall
Rangel
Regula
Rhodes
Roe
Roemer
Rogers
Rose
Rostenkowski
Sabo
Sarpalius
Saxton
Schumer
Sharp
Skeen
Slaughter
Smith (IA)
Smith (NJ)
Spratt
Stokes
Swift
Taylor (MS)
Thornton
Torres
Torricelli
Unsoeld
Visclosky
Volkmer
Vucanovich
Walsh
Whitten
Wilson
Wise
Wolf
Wyden
Wylie
Yates

NAYS—203

Allard
Allen
Andrews (ME)
Andrews (TX)
Armey
Aspin
Ballenger
Barrett
Beilenson
Bennett
Bereuter
Bilirakis
Blackwell
Boehlert
Boehner
Brewster
Brown
Bruce
Bunning
Burton
Byron
Camp
Campbell (CA)
Cardin
Carper
Clay
Coble
Coleman (MO)
Collins (IL)
Collins (MI)
Combest
Condit
Cooper
Costello
Cox (CA)
Cox (IL)
Crane
Cunningham
Dannemeyer
Dellums
Dickinson
Dooley
Doolittle
Dorgan (ND)
Dornan (CA)
Dreier
Duncan
Durbin
Early
Edwards (CA)
Emerson
Engel
English
Espy
Evans
Ewing
Fawell
Feighan
Fields
Fish
Gallegly
Gekas
Geren
Gibbons
Gilchrest
Gillmor
Gilman
Glickman
Goodling
Goss
Gradison
Grandy
Gunderson
Hall (TX)
Hancock
Hansen
Hastert
Hayes (IL)
Hefley
Henry
Herger
Hopkins
Horn
Hubbard
Hunter
Hutto
Hyde
Inhofe
Jacobs
James
Johnson (CT)
Johnson (TX)
Kasich
Kennedy
Klug
Kostmayer
Kyl
Lagomarsino
LaRocco
Leach
Levin (MI)
Lewis (FL)
Lewis (GA)
Lipinski
Luken
Machtley
Markey
Marlenee
Martinez
McCandless
McCollum
McDermott
McEwen
McGrath
McMillan (NC)
McMillen (MD)
Meyers
Mfume
Miller (CA)
Miller (WA)
Molinari
Moody
Moorhead
Morella
Murphy
Nichols
Nussle
Olver
Orton
Owens (NY)
Oxley
Packard
Pastor
Patterson
Paxon
Payne (VA)
Pease
Penny
Petri
Porter
Poshard
Ramstad
Ravenel
Ray
Reed
Ridge
Ritter
Roberts
Rohrabacher
Ros-Lehtinen
Roth
Roukema
Roybal
Russo
Sanders
Sangmeister
Santorum
Sawyer
Schaefer
Schiff
Schroeder
Sensenbrenner
Serrano
Shays
Shuster
Sikorski
Sisisky
Skaggs
Skelton
Smith (FL)
Smith (OR)
Smith (TX)
Snowe
Solomon
Spence
Staggers
Stallings
Stark
Stearns
Stenholm
Stump
Sundquist
Swett
Synar
Tanner
Tauzin
Taylor (NC)
Thomas (WY)
Towns
Traficant
Upton
Valentine
Vander Jagt
Vento
Walker
Waters
Weldon
Wheat
Williams
Wolpe
Young (FL)
Zeliff
Zimmer

NOT VOTING—72

Alexander
Annunzio
Anthony
Archer
Atkins
AuCoin
Bacchus
Barnard
Boxer
Broomfield
Campbell (CO)
Chandler
Clinger
Conyers
Darden
Davis
Donnelly
Edwards (OK)
Fascell
Flake
Ford (TN)
Frank (MA)
Gaydos
Gephardt
Gingrich
Gordon
Green
Guarini
Hatcher
Hayes (LA)
Holloway
Horton
Huckaby
Ireland
Jenkins
Johnson (SD)
Johnston
Jones
Lehman (FL)
Lent
Levine (CA)
Lowery (CA)
Manton
Martin
Mavroules
McCrery
McCurdy
Moran
Mrazek
Neal (MA)
Owens (UT)
Pickle
Richardson
Riggs
Rinaldo
Rowland
Savage
Scheuer
Schulze
Shaw
Slattery
Solarz
Studds
Tallon
Thomas (CA)
Thomas (GA)
Traxler
Washington
Waxman
Weber
Yatron
Young (AK)

☐ 2039

Ms. WATERS and Messrs. COOPER, KASICH, MARTINEZ, SCHAEFER, and OLVER changed their vote from "yea" to "nay."

Messrs. BUSTAMANTE, JONTZ, SCHUMER, WALSH, and THORNTON changed their vote from "nay" to "yea."

So the previous question was not ordered.

The result of the vote was announced as above recorded.

□ 2040

AMENDMENT OFFERED BY MR. BROWN TO THE MOTION OFFERED BY MR. BEVILL

Mr. BROWN. Mr. Speaker, I offer an amendment to the motion offered by the gentleman from Alabama [Mr. BEVILL] on amendment No. 37.

The SPEAKER pro tempore (Mr. Cox of Illinois). The Clerk will report the amendment to the motion.

The Clerk read as follows:

> Amendment offered by Mr. BROWN to the motion offered by Mr. BEVILL: Strike "the Bishop Science Center" and all that follows through "Philadelphia, Pennsylvania" and insert in lieu thereof "making competitive, merit-review awards to academic research facilities, to the extent otherwise authorized by law".

The SPEAKER pro tempore. The gentleman from California [Mr. BROWN] is recognized for 1 hour.

PARLIAMENTARY INQUIRY

Mr. MYERS of Indiana. Mr. Speaker, I have a parliamentary inquiry.

The SPEAKER pro tempore. The gentleman will state his parliamentary inquiry.

Mr. MYERS of Indiana. Mr. Speaker, a Member in opposition to this motion is not entitled to half the time?

The SPEAKER pro tempore. On an amendment to a motion, the hour is controlled by the proponent of the amendment.

Mr. MYERS of Indiana. I thank the Chair.

Mr. BROWN. Mr. Speaker, would the gentleman from Indiana [Mr. MYERS] like to have one-half hour?

Mr. MYERS of Indiana. Mr. Speaker, no. Well, yes, I would then; by popular demand, I accept.

Mr. BROWN. It is not my intention to use this hour in debate. I merely want to explain the parliamentary situation, and I will yield back the remainder of my hour.

Mr. MYERS of Indiana. Mr. Speaker, will the gentleman yield? I would like to be recognized for 5 minutes.

Mr. BROWN. Mr. Speaker, I yield 5 minutes to the gentleman from Indiana [Mr. MYERS].

(Mr. MYERS of Indiana asked and was given permission to revise and extend his remarks.)

Mr. MYERS of Indiana. Mr. Speaker, I thank my colleague, the gentleman from California, for yielding me this time.

I regret that we are taking the time at this late hour. I apologize to the membership. But I think there is a lot of misunderstanding of what we are doing here.

I know some people came on the floor and thought they were saving $100 million. That is not the case.

As I spoke earlier when many of you were not here, this does not save one penny. It is a peer fight is actually what it is, and you are going to turn the decision of how the money that is appropriated in this bill, in this provision, will go, whether it goes to the Members of the House of Representatives who have to tax the American people to pay for it, who are going to be taxed already, or you turn it over to a peer group, somebody no one will ever see or hear except that they themselves will ever know. So if you are concerned about saving the American taxpayers the money, your vote now will be against the motion offered by our colleague, the gentleman from California.

These were good projects. They are still good projects. But I doubt that very many of them will ever make it through the peer process when the big elite 20 or 30 universities decide among themselves, "Which is this, your turn to go to this university?" "No. I think I got the last one." "OK, we will give it to somebody else." This is the way the peer process that we are talking about here will be run.

So if you are concerned about saving dollars, one more time, my colleagues who voted, and some of you came on the floor and did not ask the members of the committee, but went over to somebody else and said, "What is the issue here," "pork." Well, the pork is still in. It is just where the pork is going to be located. So a no vote is a conservative vote.

Mr. BROWN. Mr. Speaker, I yield myself such time as I may consume.

Mr. Speaker, I am just going to take a minute to respond to the gentleman, because I think inadvertently he misspoke himself as my dear friend, the gentleman from Alabama [Mr. BEVILL], did earlier. This is not a question over peer review. This is a question over whether the House will authorize a project, and it so states. It says, "This money will be spent in making awards to the extent authorized by law," and that means that every Member of this House will have the opportunity to decide instead of that very elite group for whom I have the greatest admiration who sit on Appropriations conference committees. Nine of these ten projects are in the States or districts represented by the conference committee. I admire every one of them. They are wonderful people. The projects are great people.

We are not fighting over peer review. We are fighting over the right of the Members of Congress to have a say in how the taxpayers' money is spent. That is the question, and I think everyone who came in and voted on the previous question understood that.

Mr. VOLKMER. Mr. Speaker, will the gentleman yield?

Mr. BROWN. I am happy to yield to the gentleman from Missouri.

Mr. VOLKMER. Mr. Speaker, now, which committee would be the authorizing committee?

Mr. BROWN. The committees that would have jurisdiction over the facility in question, if it is a scientific research project outside of the field of medicine, it would be the Committee on Science, Space, and Technology. If it is an agriculture project, the Committee on Agriculture; if it is a health project, the Committee on Energy and Commerce. Every Member of the House who is on an authorizing committee ought to be concerned with this kind of language.

Mr. ARMEY. Mr. Speaker, will the gentleman yield?

Mr. BROWN. I am happy to yield to the gentleman from Texas.

Mr. ARMEY. Mr. Speaker, I thank the gentleman for yielding.

I will be very brief and very quick. I want to thank the gentleman for offering his amendment. This amendment is about due process and equal access to the process of having your projects considered on an equal footing with everybody else in this body irrespective of your committee assignment. It is about the extent to which a project anyplace in the country will be judged on its merit relative to other projects. It is about this body setting priorities rather than individuals.

For my part, when I am back in my district and people ask me if I oppose individual parochial projects being slipped into bills in conference by privileged Members, I say yes.

If you agree with me that that is the answer we ought to give our constituents, then I would say vote for the amendment offered by the gentleman from California [Mr. BROWN].

Mr. MYERS of Indiana. Mr. Speaker, will the gentleman yield?

Mr. BROWN. I am happy to yield to the gentleman from Indiana.

Mr. MYERS of Indiana. Mr. Speaker, I appreciate and thank the gentleman for yielding.

Several of these projects are already under construction. Two of them are complete that I am aware of. So it is not reauthorization or new authorization. Several of these are already under construction. They have been appropriated in previous years. So we are finishing two or three of these. So that is really not the argument.

Mr. BROWN. Mr. Speaker, I mentioned earlier that this process has been going on for years. We have become comfortable with it. We love and respect our colleagues on the Committee on Appropriations. We know that they try to listen to us.

Unfortunately it still happens that most of these projects are in their districts. Now, I will tell you all that in the next session of the Congress with a third new Members, they are not going to feel so comfortable about delegating their rights as representatives of the people to a clique of distinguished elder Members no matter how much we love and respect them, and we might as well prepare for that day now.

Mr. GLICKMAN. Mr. Speaker, will the gentleman yield?

Mr. BROWN. I am happy to yield to the gentleman from Kansas.

Mr. GLICKMAN. Mr. Speaker, I support my colleague, the gentleman from California, but I am concerned that even with his motion we will be obligating ourselves to spend dollars that if we were going to zero out would not be spent at all. I wonder if he could comment on that.

Mr. BROWN. Only if these are authorized in due process by the appropriate committee of Congress will this money be spent.

Mr. GLICKMAN. If the gentleman will yield further, so no dollars are being appropriated today for any specific projects in the gentleman's amendment?

Mr. BROWN. The gentleman is correct.

Mr. Speaker, I ask for a "yea" vote on my amendment.

Mr. Speaker, I yield back the balance of my time.

The SPEAKER pro tempore. Without objection the previous question is ordered.

There was no objection.

The SPEAKER pro tempore. The question is on the amendment offered by the gentleman from California [Mr. BROWN] to the motion offered by the gentleman from Alabama [Mr. BEVILL].

The question was taken; and the Speaker pro tempore announced that the yeas appeared to have it.

Mr. MYERS of Indiana. Mr. Speaker, on that I demand the yeas and nays.

The yeas and nays were ordered.

The vote was taken by electronic device, and there were—yeas 250, nays 104, not voting 78, as follows:

[Roll No. 401]

YEAS—250

Ackerman
Allard
Allen
Andrews (ME)
Andrews (TX)
Applegate
Armey
Aspin
Ballenger
Barrett
Barton
Beilenson
Bennett
Bentley
Bereuter
Berman
Bilbray
Bilirakis
Blackwell
Boehlert
Boehner
Boucher
Brewster
Brown
Bruce
Bunning
Burton
Camp
Campbell (CA)
Cardin
Carper
Clay
Clement
Coble
Coleman (MO)
Coleman (TX)
Collins (IL)
Collins (MI)
Combest
Condit
Cooper
Costello
Cox (CA)
Cox (IL)
Crane
Cunningham
Dannemeyer
de la Garza
Dellums
Derrick
Dickinson
Dicks
Dingell
Dooley
Doolittle
Dorgan (ND)
Dornan (CA)
Downey
Dreier
Duncan
Durbin
Early
Eckart
Edwards (CA)
Emerson
Engel
English
Espy
Evans
Ewing
Fawell
Feighan
Fields
Fish
Ford (MI)
Frank (MA)
Gallegly
Gekas
Geren
Gibbons
Gilchrest
Gillmor
Gilman
Glickman
Goss
Gradison
Grandy
Gunderson
Hall (TX)
Hamilton
Hancock
Hansen
Hastert
Hayes (IL)
Hefley
Hefner
Henry
Herger
Hertel
Hoagland
Hochbrueckner
Hopkins
Horn
Hubbard
Hunter
Hutto
Hyde
Inhofe
Jacobs
James
Johnson (CT)
Johnson (TX)
Jontz
Kasich
Kennedy
Kildee
Kleczka
Klug
Kolter
Kostmayer
Kyl
LaFalce
Lagomarsino
Lancaster
Lantos
LaRocco
Leach
Lehman (CA)
Levin (MI)
Lewis (FL)
Lewis (GA)
Lipinski
Lloyd
Lowey (NY)
Luken
Machtley
Markey
Marlenee
Martinez
Matsui
McCandless
McCollum
McCurdy
McDermott
McEwen
McGrath
McMillan (NC)
McMillen (MD)
Meyers
Mfume
Michel
Miller (CA)
Miller (WA)
Moakley
Molinari
Moody
Moorhead
Morella
Morrison
Murphy
Neal (NC)
Nichols
Nowak
Nussle
Oberstar
Olver
Orton
Owens (NY)
Oxley
Packard
Panetta
Patterson
Paxon
Payne (NJ)
Payne (VA)
Pease
Penny
Peterson (MN)
Petri
Pickett
Porter
Poshard
Price
Quillen
Ramstad
Rangel
Ravenel
Ray
Reed
Rhodes
Ridge
Ritter
Roberts
Rohrabacher
Ros-Lehtinen
Roth
Roukema
Roybal
Russo
Sanders
Sangmeister
Santorum
Sawyer
Schaefer
Schiff
Schumer
Sensenbrenner
Serrano
Shays
Sikorski
Sisisky
Skaggs
Skelton
Slaughter
Smith (FL)
Smith (OR)
Smith (TX)
Snowe
Solomon
Spence
Spratt
Staggers
Stallings
Stark
Stearns
Stenholm
Studds
Stump
Sundquist
Swett
Swift
Synar
Tanner
Taylor (MS)
Taylor (NC)
Thomas (WY)
Torricelli
Towns
Traficant
Upton
Valentine
Vento
Volkmer
Walker
Weldon
Wheat
Williams
Wolpe
Young (FL)
Zimmer

NAYS—104

Abercrombie
Anderson
Andrews (NJ)
Baker
Bateman
Bevill
Bliley
Bonior
Borski
Brooks
Browder
Bryant
Bustamante
Callahan
Carr
Chapman
Coughlin
Coyne
Cramer
DeFazio
DeLauro
DeLay
Dixon
Dwyer
Edwards (TX)
Erdreich
Fazio
Foglietta
Franks (CT)
Frost
Gallo
Gejdenson
Gonzalez
Goodling
Hammerschmidt
Harris
Hobson
Houghton
Hoyer
Hughes
Jefferson
Kanjorski
Kaptur
Kennelly
Kolbe
Kopetski
Laughlin
Lewis (CA)
Lightfoot
Livingston
Long
Mazzoli
McCloskey
McDade
McHugh
McNulty
Miller (OH)
Mineta
Mink
Mollohan
Montgomery
Murtha
Myers
Nagle
Natcher
Oakar
Obey
Olin
Ortiz
Pallone
Parker
Pastor
Pelosi
Perkins
Peterson (FL)
Pursell
Rahall
Regula
Roe
Roemer
Rogers
Rose
Rostenkowski
Sabo
Sarpalius
Saxton
Schroeder
Skeen
Smith (IA)
Smith (NJ)
Stokes
Torres
Unsoeld
Visclosky
Vucanovich
Walsh
Waters
Whitten
Wilson
Wise
Wolf
Wyden
Wylie
Yates

NOT VOTING—78

Alexander
Annunzio
Anthony
Archer
Atkins
AuCoin
Bacchus
Barnard
Boxer
Broomfield
Byron
Campbell (CO)
Chandler
Clinger
Conyers
Darden
Davis
Donnelly
Dymally
Edwards (OK)
Fascell
Flake
Ford (TN)
Gaydos
Gephardt
Gingrich
Gordon
Green
Guarini
Hall (OH)
Hatcher
Hayes (LA)
Holloway
Horton
Huckaby
Ireland
Jenkins
Johnson (SD)
Johnston
Jones
Lehman (FL)
Lent
Levine (CA)
Lowery (CA)
Manton
Martin
Mavroules
McCrery
Moran
Mrazek
Neal (MA)
Owens (UT)
Pickle
Richardson
Riggs
Rinaldo
Rowland
Savage
Scheuer
Schulze
Sharp
Shaw
Shuster
Slattery
Solarz
Tallon
Tauzin
Thomas (CA)
Thomas (GA)
Thornton
Traxler
Vander Jagt
Washington
Waxman
Weber
Yatron
Young (AK)
Zeliff

□ 2108

So the amendment to the motion was agreed to.

The result of the vote was announced as above recorded.

The motion, as amended, was agreed to.

The SPEAKER pro tempore. The Clerk will designate the next amendment in disagreement.

The text of the amendment is as follows:

Senate amendment No. 39: Page 33, line 22, strike out "$1,335,320,000", and insert: "$1,321,320,000".

MOTION OFFERED BY MR. BEVILL

Mr. BEVILL. Mr. Speaker, I offer a motion.

The SPEAKER pro tempore. The Clerk will designate the motion.

The text of the motion is as follows:

Mr. BEVILL moves that the House recede from its disagreement to the amendment of the Senate numbered 39 and concur therein with an amendment, as follows: In lieu of the sum stricken and inserted by said amendment, insert: "$1,256,320,000".

The SPEAKER pro tempore. The question is on the motion offered by the gentleman from Alabama [Mr. BEVILL].

The motion was agreed to.

The Clerk will designate the next amendment in disagreement.

The text of the amendment is as follows:

Senate amendment No. 43: Page 36, strike out all including line 1 over to and including line 3 on page 38, and insert:

NUCLEAR WASTE DISPOSAL FUND

For nuclear waste disposal activities to carry out the purposes of Public Law 97-425, as amended, including the acquisition of real property or facility construction or expansion, $275,071,000, to remain available until expended, to be derived from the Nuclear Waste Fund. To the extent that balances in the fund are not sufficient to cover amounts available for obligation in the account, the Secretary shall exercise his authority pursuant to section 302(e)(5) of said Act to issue obligations to the Secretary of the Treasury: *Provided*, That of the amount herein appropriated, within available funds, not to exceed $5,000,000 may be provided to the State of Nevada, for the sole purpose in the conduct of its oversight responsibilities pursuant to the Nuclear Waste Policy Act of 1982, Public Law 97-425, as amended: *Provided further*, That of the amount herein appropriated, not more than $6,000,000 may be provided to affected local governments, as defined in the Act, to conduct appropriate activities pursuant to the Act: *Provided further*, That the distribution of the funds herein provided among the affected units of local government shall be determined by the Department of Energy (DOE) and made available to the State and affected units of local government by direct payment: *Provided further*, That within 90 days of the completion of each Federal fiscal year, each entity shall provide certification to the DOE, that all funds expended from such direct payment monies have been expended for activities as defined in Public Law 97-425, as amended. Failure to provide such certification shall cause such entity to be prohibited from any further funding provided for similar activities: *Provided further*, That none of the funds herein appropriated may be used directly or indirectly to influence legislative action on any matter pend-

Smith (IA)
Smith (NJ)
Smith (OR)
Smith (TX)
Snowe
Solarz
Solomon
Spence
Spratt
Staggers
Stallings
Stark
Stenholm
Stokes
Studds
Stump
Sundquist
Swett
Swift

Synar
Tallon
Tanner
Tauzin
Taylor (MS)
Thomas (GA)
Thomas (WY)
Thornton
Torres
Torricelli
Towns
Traficant
Traxler
Unsoeld
Valentine
Vento
Visclosky
Volkmer
Walker

Walsh
Washington
Waters
Weldon
Wheat
Whitten
Williams
Wilson
Wise
Wolf
Wolpe
Wyden
Wylie
Yates
Yatron
Young (FL)
Zeliff
Zimmer

NAYS—36

Allard
Allen
Armey
Bilbray
Bilirakis
Bunning
Burton
Cox (CA)
Crane
Cunningham
Doolittle
Dorgan (ND)

Dornan (CA)
Duncan
Gallegly
Goss
Hammerschmidt
Hancock
Hefley
James
Johnson (TX)
Kaptur
Lagomarsino
Lancaster

Lewis (CA)
Lewis (FL)
Marlenee
Packard
Roberts
Ros-Lehtinen
Taylor (NC)
Thomas (CA)
Upton
Vander Jagt
Vucanovich
Young (AK)

NOT VOTING—16

Ballenger
Barnard
Boxer
Chandler
Clement
Edwards (OK)

Lipinski
Lowery (CA)
McCloskey
Mrazek
Owens (UT)
Shaw

Sikorski
Stearns
Waxman
Weber

□ 1324

Mr. VANDER JAGT and Mr. ARMEY changed their vote from "yea" to "nay."

Mr. EDWARDS of Texas changed his vote from "nay" to "yea."

So the resolution, as modified, was agreed to.

The result of the vote was announced as above recorded.

A motion to reconsider was laid on the table.

REPORT ON RESOLUTION WAIVING POINTS OF ORDER AGAINST CONFERENCE REPORT ON H.R. 5504, DEPARTMENT OF DEFENSE APPROPRIATIONS ACT, 1993

Mr. FROST, from the Committee on Rules, submitted a privileged report (Rept. No. 102-1020) on the resolution (H. Res. 602) waiving points of order against the conference report to accompany the bill (H.R. 5504) making appropriations for the Department of Defense for the fiscal year ending September 30, 1993, and for other purposes, and against the consideration of such conference report, which was referred to the House Calendar and ordered to be printed.

REPORT ON RESOLUTION WAIVING POINTS OF ORDER AGAINST CONFERENCE REPORT ON H.R. 5334, HOUSING AND COMMUNITY DEVELOPMENT ACT OF 1992

Mr. FROST, from the Committee on Rules, submitted a privileged report (Rept. No. 102-1021) on the resolution (H. Res. 603) waiving points of order against the conference report to accompany the bill (H.R. 5334) to amend and extend certain laws relating the housing and community development, and for other purposes, and against the consideration of such conference report, which was referred to the House Calendar and order to be printed.

REPORT ON RESOLUTION WAIVING POINTS OF ORDER AGAINST CONFERENCE REPORT ON H.R. 429, RECLAMATION PROJECTS AUTHORIZATION AND ADJUSTMENT ACT OF 1992

Mr. FROST, from the Committee on Rules, submitted a privileged report (Rept. No. 102-1022) on the resolution (H. Res. 604) waiving points of order against the conference report to accompany the bill (H.R. 429) to authorize additional appropriations for the construction of the Buffalo Bill Dam and Reservoir, Shoshone Project, Pick-Sloan Missouri Basin Program, Wyoming, and against consideration of such conference report, which was referred to the House Calendar and ordered to be printed.

CONFERENCE REPORT ON H.R. 5504, DEPARTMENT OF DEFENSE APPROPRIATIONS ACT, 1993

Mr. FROST. Mr. Speaker, by direction of the Committee on Rules, I call up House Resolution 602 and ask for its immediate consideration.

The Clerk read the resolution, as follows:

H. RES. 602

Resolved, That upon adoption of this resolution it shall be in order to consider the conference report to accompany the bill (H.R. 5504) making appropriations for the Department of Defense for the fiscal year ending September 30, 1993, and for other purposes. All points of order against the conference report and against its consideration are waived. The conference report shall be considered as read.

Mr. BROWN. Mr. Speaker, I am opposed to the rule. I request one-third of the time.

The SPEAKER pro tempore (Mr. MAZZOLI). The Chair would advise the gentleman from California that that rule of division of time does not apply in the circumstances under which we are operating today, but the gentleman can certainly ask and obtain time to speak about the rule.

The gentleman from Texas [Mr. FROST] is recognized for 1 hour.

Mr. FROST. Mr. Speaker, at the outset let me state that it is my intention to yield time to the gentleman from California [Mr. BROWN] during consideration of the rule.

Mr. Speaker, for purposes of debate only, I yield 30 minutes to the gentleman from New York [Mr. SOLOMON], pending which I yield myself such time as I may consume. Mr. Speaker, during debate on this resolution, all time is yielded for the purpose of debate only.

(Mr. FROST asked and was given permission to revise and extend his remarks.)

Mr. FROST. Mr. Speaker, in order to expedite the consideration of the conference report to accompany H.R. 5504, the appropriation for the Department of Defense for fiscal year 1993 prior to our adjournment tonight or tomorrow, the Committee on Rules is recommending a rule which provides for the consideration of H.R. 5504, waives all points of order against the conference report, waives all points of order against the consideration of the conference report, and provides that the conference report shall be considered as read. This rule is identical to several other rules which have been recommended by the Committee on Rules for the consideration of the conference reports accompanying the various appropriations bills.

In fact, Mr. Speaker, the conference report accompanying H.R. 5504 is the product of many months of negotiations. The conference report, which tracks the authorization passed by the House and Senate on big ticket items, is well below the subcommittee's 602(b) allocation. The bill reflects the new realities of the world which face our Armed Forces today and I urge adoption of the rule in order that the House may proceed to the consideration of this most important legislation.

Mr. Speaker, I reserve the balance of my time.

Mr. SOLOMON. Mr. Speaker, I yield myself such time as I may consume.

Mr. Speaker, the appropriations bill that this rule would make in order for expeditious debate on the floor of the House is one of the broadest and most comprehensive that we will consider in this Congress.

Let me limit my remarks on the bill to these: It appropriates approximately $254 billion for our national defense in fiscal year 1993, and I think every Member should know that that is $16 billion below the fiscal year 1992 appropriation, and $7 billion below the President's request. Despite that, it is a bill that the President reportedly can sign, having worked with the House and the Senate to forge myriad compromises on a great number of issues. Mr. Speaker, we may not all agree on those compromises, but, nevertheless, the conferees did come to agreement.

□ 1330

Mr. Speaker, while adoption of this rule will allow us to get on with this important business as we move toward adjournment today or tomorrow, in our Rules Committee hearing just a little while ago, it became apparent to all of us that it is not a perfect rule.

In particular, the gentleman from California [Mr. BROWN], of the Committee on Science, Space, and Technology, appeared before the Committee on Rules to oppose waivers of points of order when it comes to certain items contained in this bill.

Mr. Speaker, I am sure that there are Members here that would like to know what the controversies might be on this rule. There are others who want to explain them. It is fair that they be heard.

We all have great respect for the gentleman from California [Mr. Brown], who appeared before our Committee on Rules to oppose the waivers of points of order in this rule, when it comes to certain medical research items in the bill. And I have also just discovered that there is a line, one simple line in this appropriations bill, which enacts the "Native Hawaiian Health Act" that this House overwhelmingly defeated under suspension of the rules.

I point these things out only to say that I think that they underline the real need for reform, something many of us have been working for in this House.

Mr. Speaker, the gentleman from Washington [Mr. Foley] has yet to appoint the House Democrat Members of the Hamilton-Gradison Task Force, while I think Mr. Dole has appointed the Senate Republican Members, and the gentleman from Illinois [Mr. Michel] has appointed the House Republican Members.

We really need to get on with this reform effort. These are the problems that upset every Member of this House.

I will be yielding time on both sides of this issue so that these issues can be heard.

Mr. Speaker, I reserve the balance of my time.

Mr. FROST. Mr. Speaker, for purposes of debate only, I yield 5 minutes to the gentleman from California [Mr. Brown].

Mr. SOLOMON. Mr. Speaker, I yield 1 minute to the gentleman from California [Mr. Brown].

The SPEAKER pro tempore (Mr. Mazzoli). The gentleman from California [Mr. Brown] is recognized for 6 minutes.

(Mr. BROWN asked and was given permission to revise and extend his remarks.)

Mr. BROWN. Mr. Speaker, I thank the distinguished member of the Committee on Rules for yielding time to me.

Again, I apologize for taking up the time of the House at this late day and hour on something which should never have been brought before the House.

I remind the Members of the House that it was only a short time ago that we took up the Energy and Water appropriations bill and, in connection with one amendment, which appropriated funds for $94 million worth of unauthorized appropriations, we struck that language by a 70-percent vote in the House. And now, magically, that language appears again, overriding the previous action of the House, in this bill.

And I could read my colleagues that language, but I think we have passed out sufficient information to indicate to them what it is. I will not bother to do that again.

In effect, a small number of Members, senior members of the Committee on Appropriations, have decided that the will of the House, as expressed by that 70-percent vote, has no meaning and significance.

Let us mention a couple of other things. The content of the subject matter here is in the civilian portion of the Department of Energy. It is not within the jurisdiction of either the Committee on Armed Services in the House and the Senate or the Military Appropriations Subcommittee of the House and Senate. It is entirely out of scope.

Now, I tried to identify the roots of this problem, when we took it up on the Energy and Water bill. We have a very distinguished Member of the other body who chairs the authorizing committee for energy and water and the Committee on Appropriations Subcommittee for Energy and Water and for 10 years, because of the great press of work that he has in the Senate, he has refused to consider any authorization legislation.

Part of that has been the fault of the House. We have not always done our job. But I have talked with this distinguished gentleman, and he is just not convinced that the Senate needs our help in authorizing these projects. They can do it very well on the Committee on Appropriations.

We debated that in the conference on the Energy bill, the long-range energy strategy bill. He made some minor concessions. One thing he was adamant on, he would not agree to the House authorizing any projects or facilities. There is no language in that Energy bill which would implement the clear language of the Organic Act of the Department of Energy which says there shall be an annual authorization bill.

For 10 years, this situation has been continuing. My colleagues will understand that I take a little umbrage at the fact that we have been unable to remedy it.

The distinguished gentleman from New York [Mr. Solomon] suggests we need a change in the rules. That was suggested to me in the Committee on Rules this morning. We need a change in the rules. I hesitate to point out, the rules already prohibit this.

What the Committee on Rules has done is waive the rule. We can change the rules until we are blue in the face, but if we waive them, then it is to no effect. I am sure my good friend from New York recognizes that.

Now, let me say to my colleagues that this last-minute effort to revive a project, 10 projects, actually, overwhelmingly rejected by the House represents precisely the thing that the American people are rebelling against—a small clique of powerful Members sitting in a back room, sneaking through things which have had no consideration and getting them through without anybody knowing what they are.

I had to stand up here and look through a thousand page bill, and I had some motivation to do it, most Members do not, until I found that one paragraph which reversed what we did just 3 weeks ago.

Mr. Speaker, I consider this to be the most egregious insult to the privileges of the House that I have ever seen in 28 years here. Mr. Speaker, if the House, in its wisdom, does not defeat this rule and have it brought back without a waiver or without this provision, I can assure my colleagues that the press in this country will be writing editorials about how the House has not changed its ways. It is just as bad as ever, and we might as well throw them out or limit their terms or something else. They refuse to correct their own sins.

I assure my colleagues that this is an issue which is right at the heart of the problems that this country faces. We cannot legitimately legislate with this kind of back-door approach to reversing the decisions made in either House. I ask my colleagues to help me defeat this rule in order that the will of the House may be upheld.

☐ 1340

Mr. BROWN. I yield to the gentleman from New York.

Mr. SOLOMON. Mr. Speaker, I have the greatest admiration and respect for the gentleman from Pennsylvania [Mr. Murtha] and his subcommittee. They do a great job, so I do not mean to cast any aspersions against them, but the truth of the matter is that when that other body over there knows that we are going to be issuing blanket waivers on all of these rules in these last weeks and days, this is how these things come about.

We put out a rule, for instance, on the native Hawaiian health bill that is pending. It can be brought up before the House. Instead of that, they know that there will be a blanket waiver, and therefore they stick all this stuff in there. That is how we get ourselves in this problem, so I appreciate the gentleman's remarks.

Mr. BROWN. Mr. Speaker, just one word in conclusion. I have already indicated that the action previously taken received overwhelmingly favorable response in the press around the country, particularly the scientific press. I have indicated that the action to reverse that will get an even greater negative publicity.

While I have been reluctant to mention the names of any of the individuals involved here, and I will continue not to mention the names of the individuals involved, I think that the Members will find their names being spread not only in the national press but in every local newspaper in their districts, and I guarantee it will not help them one bit.

Mr. SOLOMON. Mr. Speaker, I yield 7 minutes to the gentleman from Kentucky [Mr. Rogers], a distinguished member of the Committee on Appropriations.

Mr. FROST. Mr. Speaker, I yield 4 minutes to the gentleman from Kentucky [Mr. Rogers].

The SPEAKER pro tempore. The gentleman from Kentucky [Mr. ROGERS] is recognized for 11 minutes.

Mr. ROGERS. Mr. Speaker, I thank the gentleman for yielding time to me.

Mr. Speaker, as we debate the Defense Department appropriations bill, I went to take just a few short minutes here, off the topic, to pay tribute to a member of the authorizing Committee on Armed Services in this body who is departing us this year, retiring, DAVID O'B. MARTIN from upstate New York, a 1980 classmate of mine. I think I can safely say, on behalf of all the Members of this body, one of the closest friends that each of us has: a gentleman who served this body with great distinction, not only representing very ably the upstate New York area, for the last 12 years, but has represented this Nation, most importantly, in a very able way on the Committee on Armed Services, a job which he took extremely seriously.

This former marine, and I do not think one can ever say a marine is a former one, but this marine fighter pilot, who served with distinction in Vietnam for our country and who has served these 12 years in this body, ably and with great courage, would speak his mind, but always in good temper and with good humor.

I am certainly going to miss this stalwart of the American eagle, and I am sure I speak for every Member of this body when I say that.

Mr. ROBERTS. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I am happy to yield to the gentleman from Kansas.

Mr. ROBERTS. Mr. Speaker, I thank the gentleman for yielding.

It is a personal honor for me to associate myself with the remarks of the gentleman from Kentucky on behalf of my good friend, DAVID O'B. MARTIN. When we serve in this House we see many people with different attributes. We have the floor people who talk a lot, we have those who make their mark in committees, we have partisans, and we sure have heard a lot of those as of late.

Then we have a few Members like DAVE MARTIN who came here with conviction and purpose, who served with conviction and purpose, and who will leave that reputation.

As the gentleman has indicated, the gentleman from New York [Mr. MARTIN] is not only a member of this select fraternity but another as well in the Marine Corps, and the gentleman is right, there are no ex-marines, there are former marines, but our motto is "Semper Fidelis," always faithful. That motto also describes Mr. MARTIN and his work on behalf of our men and women in the service, on behalf of our national defense, and our position of leadership in the world today.

I would say to the gentleman, I thank him for being a good and loyal friend, and outstanding Member of Congress, and DAVID, when we pass the sugar, you will be remembered.

Mr. MURTHA. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I yield to the gentleman from Pennsylvania.

Mr. MURTHA. Mr. Speaker, I want to associate myself with the gentleman's remarks. There is certainly no individual Member that has done more in defense than DAVID MARTIN. We appreciate his hard work and dedication, and we are going to miss him. I just wanted to add my compliments for his dedication and hard work.

Mrs. SCHROEDER. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I yield to the gentlewoman from Colorado.

Mrs. SCHROEDER. Mr. Speaker, I would like to join in on this, too. DAVID has been the ranking member on the committee I chair, on the Committee on Armed Services, and I am sure I have driven him absolutely nuts. I hope I am not part of the reason he left. The gentleman is very dedicated, and I really appreciated his hard work. I thank the gentleman for pointing this out. As I say, he has been a stellar Member.

I hope I am not the main reason he is leaving, but he has always been very easy to work with and really cared a lot.

Mr. SOLOMON. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I am happy to yield to the gentleman from New York.

Mr. SOLOMON. Mr. Speaker, I would like to say I have always been suspicious of DAVID MARTIN. He followed me into the world. He is a little younger than I am. He then followed me into the U.S. Marine Corps, a little later than my tenure and that of my good friend, JOHN MURTHA. Then he later followed me into the New York State General Assembly. Then he showed up here in Congress about 12 years later.

The point I want to make about DAVID MARTIN is this. He represents an area of New York State in this country that is a huge area. It is the Adirondack Mountains of New York State. It covers about 30,000 square miles, 20,000 larger than my own. It is probably the safest Republican district in America, and yet DAVE MARTIN, at the age of 47, chose of his own accord to retire. He did that because he feels he has done his duty to this country, and Mr. Speaker, I know of no man who had done as much in the way that he has in serving his country. He is just a great American.

Mr. DICKS. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I yield to the gentleman from Washington.

Mr. DICKS. Mr. Speaker, I would like to join this colloquy. DAVID MARTIN has been an outstanding member of the House Committee on Armed Services. He has been really one of the most open and constructive members. The people of Washington State have benefited mightily by his evenhanded leadership, particularly in the military construction area, and I just want to wish him the very best. He has been a good friend and a solid contributor in the House, and someone who we are going to miss very, very much next year. I wish him well.

Mr. WALSH. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I yield to the gentleman from New York.

Mr. WALSH. Mr. Speaker, I would like to lend my voice briefly going to some of the accolades. I know that Mr MARTIN is sitting somewhere in the corner of this room with his head down, trying to ignore all of this. He is man of great humility, who came here with his feet squarely on the ground leaving with his feet squarely on the ground, and leaving behind him a number of junior Members like myself who have looked to him for advice and counsel and support, and we thank him very much.

Mr. KASICH. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I yield to the gentleman from Ohio.

Mr. KASICH. Mr. Speaker, I thank the gentleman for yielding to me.

Mr. Speaker, I am going to miss DAVE MARTIN very much. I sat with him for 10 years on the Committee on Armed Services, and he always sat on my right side, because he was senior to me. For 10 years I was always bumping him and rubbing his arm and saying "Can you believe what they are saying? Can you believe that?" I wore out more left sides of his suits. I might have to buy him a couple of extra suits before it is all said and done.

DAVE just had so much conviction on that committee and I have to tell the Members just one case, the F-14. He turned out to be 100 percent correct on that. That is just an example of how he knew things that many of us did not know, and had compassion about it. We are going to miss him because he was a great member of that committee.

Mr. FAZIO. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I am happy to yield to the gentleman from California.

Mr. FAZIO. Mr. Speaker, I thank the gentleman for yielding.

The gentleman from New York [Mr SOLOMON] said that DAVID MARTIN represents maybe one of the most Republican districts in the Nation, but eveybody here in Congress knows that he is one of the most bipartisan kind of figures that we have seen. He comes from a point of view, but he never really stops listening to the other guy's point of view.

DAVE has been so solid on military construction issues. I have worked on these for the entire time we have served together, and I do not know of a Member who is more effective, objective, and dedicated to the job that he has been given. I really think we are all going to miss him when he goes back to the north country of New York State.

Mr. McDADE. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I yield to the gentleman from Pennsylvania.

Mr. MCDADE. Mr. Speaker, I thank my friend, the gentleman from Kentucky, for yielding to me, and I applaud him for taking these few moments to pay tribute to a gentleman whom we all hold in the highest esteem for his public service.

Mr. Speaker, I just want to say, as a Member who has been privileged to be a part of this organization in this body for 30 years, that as we look back all of us will hold up benchmarks of people who have made this a better institution, who have made this a better country. Any time we set that benchmark up, the name DAVE MARTIN is going to be at the top of that. We wish him all success in his future endeavors.

Mr. CAMP. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I yield to the gentleman from Michigan.

Mr. CAMP. Mr. Speaker, I, too, want to commend DAVID MARTIN for the fantastic job he has done in the Congress. As a relatively new Member in the body, I have come to rely on his advice, his commonsense approach, and him calling them like he sees them. I am going to wish him the best, along with everybody else.

Mr. RHODES. Mr. Speaker, will the gentleman yield?

Mr. ROGERS. I yield to the gentleman from Arizona.

Mr. ROGERS. Mr. Speaker, I am not a member of the committee, I am not from New York. I am not an ex-marine, but I am one of DAVE MARTIN's friends.

☐ 1350

I remember the thrill that went through this side of the House when the rumor began to spread that DAVID OBEY was going to retire, until we found out it was DAVID O'B. MARTIN.

Come on, guys, you get it.

The only promise not fulfilled is the promise that DAVID O'B. MARTIN made to me to take me to the National Training Center in California. I am going to make him fulfill that promise. He is a friend and a buddy, and I will miss you DAVID. Thank you for everything.

Mr. ROGERS. Mr. Speaker, I want to thank those who have quickly come forward here to say a few words.

I yield to the other DAVID OBEY.

Mr. OBEY. Mr. Speaker, I want to say that I too will miss DAVE, and I too was happy that it was DAVE O'B. MARTIN who was retiring.

Mr. ROGERS. Mr. Speaker, I want to thank everyone who has come forward in this spontaneous and quick tribute to our friend, DAVID O'B. MARTIN. Certainly we will all miss his good humor, and his courage, and frankness, in the discharge of his obligations here. He is the father of Fort Drum, the father of Plattsburgh Air Force Base, and the guiding light of the north country of New York. DAVE is a personal friend, a confident, an adviser, a funloving get very serious colleague. No one has more patriotism and love of country than DAVE. We will miss you, and we will hope that you will come back and visit with us poor servants down through the years. Godspeed in your next undertaking.

Mr. SOLOMON. Mr. Speaker, I yield 3 minutes to the gentleman from Illinois [Mr. FAWELL].

Mr. FAWELL. Mr. Speaker, I thank the gentleman for yielding the time.

Mr. Speaker, I hate to change the tune and the fine attitude we have here right now, but I rise in strong support of what Chairman BROWN has already uttered. I object strenuously to the fact that this rule should, in effect, provide for the transfer of $94.8 million of pure pork to the defense conference committee bill from the Energy and Water conference committee appropriation bill—spread among 10 higher educational institutions—at the request of certain members, when a short time ago this House voted overwhelmingly to delete that same appropriation for those same institutions in the Energy and Water appropriation bill. At that time, this body considered the appropriation. Mr. BROWN made eloquent points, and there was an overwhelming conclusion that this kind of pork ought not to be in these last-minute appropriations that come out of conference committees.

Neither bill going into the Defense conference committee or the Energy and Water conference committee said anything about these appropriations. And in the Brown amendment which passed previously relative to the Energy and Water appropriations bill, Chairman BROWN made it very, very clear that the amount of the appropriation would be remaining, but that there would have to be a full authorization hearing. The Brown amendment stated that there should also be competitive merit review before any recipients of this appropriation were chosen; that the various educational institutions that would receive the $94.8 million in grants to do research would finally be determined by the appropriate substantive committees, and that such grants ought not to be determined by just some special people who happen to be on a conference committee of one of our appropriation bills.

Now we come along and all of that is undone. It was agreed to when we sent the appropriations back to the Energy and Water conference committee by the other body, and then furtively they come along here at the last minute, when we know that this is when the heists take place, and at the very last minute when nobody is looking these same appropriations show up as part of the Defense conference committee's recommendations. Now, we ought to have red bandannas on our face before we can ever vote for something like this. It is a monstrous thing we are doing, and in the face of public opinion about the mounting draft and annual deficits we are saying the public be damned, we'll spend as we please without authorizations or merit review or any hearings whatever. This body has not heard the people's message. We have not even got a bit of redemption in our souls if we can stand by and see this rape take place.

ANNOUNCEMENT BY THE SPEAKER PRO TEMPORE

The SPEAKER pro tempore (Mr. MAZZOLI). The Chair would admonish the gentleman that earlier he used the word "furtive," and now he used the term "rape." The gentleman might want to reconsider the nature of the latter terminology. He may properly characterize the actions of the conference committee. But to characterize those in that way may be a violation of the rules of the House.

Mr. FAWELL. Mr. Speaker, I apologize to the Chair. I may have been a bit emotional. But what I am trying to bring about, of course, is we all know what is happening here. The Rules Committee should not have done this. The Rules Committee should not be the handmaiden, that's the word which comes to mind, of certain privileged members who happen to be on the Department of Defense conference committee—and may be that is too strong too. But this body made its feelings so very, very clear during the debate on the Energy and Water appropriation bill that the House did not support these earmarks. Now, in the Department of Defense appropriation bills, at the last minute, these projects which were deleted have reappeared. This Congress should not do something like this especially on a science appropriation, when we all know that no committee has given any thought to these appropriations, no hearings have been held whatsoever, and we just waive all that. It is untenable. I know we have waived authorizations before, but under these circumstances, especially when it was so clear that this body wanted this to go back to the committees of jurisdiction for substantive hearings where we could have that kind of a full, real, meaningful authorization. And we wanted it to be competitive in nature. We wanted to have some peer review and input.

To do this in the waning hours of this Congress I think is wholly indefensible. I hope this body will rise in support of our esteemed chairman of the Science, Space, and Technology Committee who, yes, does have the intestinal fortitude to get up and express himself, probably a lot better than I. I again apologize for any strong words that I may have used. But I feel strongly about this. If we can't control our greed for special pork for our districts on matters like this, I don't know what hope there is for this body. I certainly support Chairman BROWN to the fullest extent.

Mr. FROST. Mr. Speaker, for the purpose of debate only, I yield 2 minutes to the gentlewoman from Ohio [Ms. OAKAR].

(Ms. OAKAR asked and was given permission to revise and extend her remarks.)

Ms. OAKAR. Mr. Speaker, I want to mention two issues that were granted a waiver in the Defense appropriation bill that I think are very critical and important.

One is the $1.7 billion that they used to transfer from the military budget to economic conversion. We know when we reduce the military budget we are going to see about a million jobs lost unless we convert the military industrial base to a civilian industrial base. And this particular conference report is able to do that.

We know that if we give these small businesses who are dependent on defense contracts the tools to convert, to retool and to retrain their employees, we can save our industrial base in this country and not lose all of those jobs. So I think that is a very positive factor in this bill.

Second, I want to thank Chairman MURTHA for allowing another transfer. Yes, maybe it was the back door, but unfortunately there are times when women's health issues have to be addressed in this manner. And the chairman of the committee was able to get for the women in Congress, who have fought to have more research in breast cancer, $210 million for breast cancer research taken out of the $26 billion we use for military research. This is one kind of transfer that I am for.

Breast cancer is an epidemic in this country. One out of eight women will get breast cancer. The women in Congress asked for $300 million. With this $210 million and the other $70 million or more that is in Chairman NATCHER's bill, we will have almost the $300 million. So this is a waiver that I support.

Now let us look at the total picture here, because we could not get anybody else to put that kind of money to play the catch-up ball that we have to because of the fact that women's health issues have been totally neglected. A couple of years ago I had to get furious on the floor when some of the men took out mammography legislation from the Budget Committee.

□ 1400

You do not want to have to do that again, so I urge you to keep that $210 million. I urge you not to call a point of order about the breast cancer research or the economic conversion legislation that is part of this bill.

These are very, very good waivers, and we ought to stand up and defend these waivers. It is about time we did them. I thank the chairman for putting them in.

Mr. SOLOMON. Mr. Speaker, I yield 2 minutes to the gentleman from California [Mr. DANNEMEYER]. We are going to miss him, too.

(Mr. DANNEMEYER asked and was given permission to revise and extend his remarks.)

Mr. DANNEMEYER. Mr. Speaker, this bill is an excellent illustration of that bromide that we have all used on the stump in town hall meetings: There are two things you do not want to watch, and that is the legislature in session and sausage being made.

Because about a week ago the House considered some Hawaiian pork legislation, the creation of a separate, independent, taxpayer-funded by the Federal Government health care system just for native Hawaiians. I love Hawaii, and I love Hawaiians. They are wonderful people. But we are dealing with Federal taxpayer dollars here.

Bear in mind, there is in Hawaii a community health care center financed by Federal taxpayers' dollars to take care of the medically indigent people of Hawaii.

This bill was brought up on suspension, and as you know, on suspension it takes two-thirds to be passed, and there were 194 votes against it, so it has to tell you that there is something wrong with this Hawaiian pork.

Now, the Senate also passed another bill called S. 2531. The House has never passed this bill.

The proponents of the bill went back to the Committee on Rules, or should have, to get a rule to bring it back under normal procedure, but we have not done that at all, because if you read the defense appropriation bill, you find on the last page a little statement that says it all: "S. 2531, as passed by the Senate on September 2, 1992, is hereby enacted into law."

The defense appropriation bill is being used as a vehicle for establishing the coming into existence of this Hawaiian port, and the Committee on Rules put out a rule that says it waives all points of order so that I cannot stand here and object to the inclusion of this pork in the Defense appropriation bill.

I say to the gentleman from California [Mr. BROWN], you are absolutely right. This measure is a travesty for the reasons the gentleman has identified. It is a further travesty for the reasons that I have identified.

I hope, even though this is probably the last day that we will stick around here long enough to clean up this aberration, reject this rule, and have some sanity in how we proceed.

Mr. SOLOMON. Mr. Speaker, I yield myself such time as I may consume.

Mr. Speaker, in my opening remarks I inadvertently said that the native Hawaiian health bill was overwhelmingly defeated under suspension of the rules. The gentlewoman from Hawaii [Mrs. MINK] has informed me that it did, in fact, win a narrow margin, 228 to 194. I would like to correct my previous remarks.

Mr. Speaker, I yield 3 minutes to the gentleman from Indiana [Mr. BURTON].

Mr. BURTON of Indiana. Mr. Speaker, the gentleman from California [Mr. BROWN] is right. The gentleman from California [Mr. DANNEMEYER] is correct. The fact of the matter is this bill has major problems, one of which is that the Committee on Rules waived all points of order, and when they waived all points of order, they waived all points of order including section 174, and section 174 of this bill mandates that the Department of Defense replace all of the locks on all of the safes in the world dealing with national security with a new electronic lock. Seventy thousand safes are going to have to be replaced with new locks, and it is going to cost $140 million. And the new lock does not even work. It does not work.

We are mandating because they waived all points of order that the Department of Defense put these new locks on safes.

I want to read to you what the GSA says about these locks in September, less than 30 days ago. They said.

> The National Security Agency has rescinded their approval of the Mas-Hamilton XO-7 electronic lock pending further investigation. It is OK if you already purchased one and are using it, but be aware you would experience problems such as unable to open a safe and possible other computer-related problems.

The lock does not work. There was an agreement that was worked out, an oral agreement between the GSA and the manufacturers, which said that as the new lock was perfected, they would replace the old locks in a reasonable way with these new locks, but, no, what happened was the Senator from Kentucky got language into this bill that is going to force the change when the locks do not work.

It is going to cost the taxpayers of this country $140 million.

We should defeat this rule, send it back up there and get the waiver removed so we can take this out.

It is wrong. It is a waste of $140 million. We should not tolerate it. It is another example of how this place is heading this country in the wrong direction with wasteful spending.

Mr. FROST. Mr. Speaker, for purposes of debate only, I yield 4 minutes to the gentleman from North Carolina [Mr. VALENTINE].

Mr. VALENTINE. Mr. Speaker, I thank the gentleman for yielding me this time.

I want to reluctantly come, and do reluctantly come, to the well of the House to offer congratulations to my chairman, the gentleman from California [Mr. BROWN], who has again demonstrated the courage to fly in the face of those here in positions of responsibility and leadership who would continue to try to thwart the will of this House.

I have heard the name of the gentleman from California [Mr. BROWN], since September 17, mentioned in not so unfriendly terms, and it will be a great source of pride to me if my name joins his in the future.

Because this, I suggest to my colleagues, approaches scandalous behavior. I do not know what some people think that most of us here are about.

About 3 weeks ago, September 17, this House rejected these unauthorized 10 projects by a vote that was what you people call veto-proof, 250 to 104. Yet those here who have the power have struck these projects back in this rule hoping and expecting that we will be too close to the need to go home to say much about it, and that you will swallow this dose of diluted poison.

We try hard, some of us, to defend this institution, some of us, to explain the better sides of it to folks back home. But this kind of thing makes it difficult.

These projects have very little to do with water resource development, when they were rejected 250 to 104, and they have absolutely nothing to do with defense.

I suggest to my colleagues that if you are watching that, if you have any respect for this institution, you will come down here to the Chamber and help us reassert, reassert the rules, the good name of those of us who are rank-and-file Members, and defeat this rule and send them back in the hope that they will do the right thing.

Mr. TRAXLER. Mr. Speaker, will the gentleman yield?

Mr. VALENTINE. I yield to the gentleman from Michigan.

Mr. TRAXLER. Mr. Speaker, I thank the gentleman for yielding.

Could the gentleman tell me where the authorization bill is for science and technology? You see, it has been in the Senate now for, I think, several months. Could the gentleman give us some advice or information as to whether or not it is going to be considered?

Mr. VALENTINE. I would say to the gentleman that it has been in the Senate, and I could not answer that question. But I do not think that has got anything to do with 10 pieces of poor unauthorized pork.

Mr. TRAXLER. Could I further inquire of the gentleman, if he will permit me. I am trying to get some help, and maybe the chairman could also help us.

Mr. VALENTINE. Is the gentleman asking me to tell him what happened to legislation that is in the Senate?

Mr. TRAXLER. I am trying to find out where your authorization bill is. I guess what I really would like to know is——

Mr. VALENTINE. I would say to the gentleman that I do not know. Maybe he ought to have more, I respectfully suggest, from his position, he would know more about what the Senate has done.

Mr. TRAXLER. Is it fair to say that the authorization bill for science and tech might come before this body at some point on a suspension of the rules?

Mr. BROWN. Mr. Speaker, will the gentleman yield?

Mr. VALENTINE. I yield to the gentleman from California.

Mr. BROWN. My distinguished friend from Michigan obviously rises to cast some doubt here on what we are doing, and assert the prerogatives of the Committee on Appropriations to do anything they want.

Mr. TRAXLER. The gentleman is wrong in his assumption.

Mr. BROWN. The gentleman who is speaking is wrong. There is no authorization for science and technology. It is not authorized in a single bill.

The question is meaningless.

□ 1410

Mr. SOLOMON. Mr. Speaker, I reserve the balance of my time.

Mr. FROST. Mr. Speaker, for purposes of debate only, I yield 3 minutes to the gentleman from Minnesota [Mr. PENNY].

(Mr. PENNY asked and was given permission to revise and extend his remarks.)

Mr. PENNY. I thank the gentleman for yielding.

Mr. Speaker, I am not sure whether I should criticize or compliment the Committee on Appropriations on their performance. Clearly, I am not pleased with the fact that proposals which we thought we had rejected by a significant vote as recently as 2 weeks ago have now cropped back up in this defense bill. But I must compliment them for their legislative creativity and finding another way to bring these 10 items of port back before the Congress.

As Yogi Berra once said, "It is déjà vu all over again." As I read in the defense appropriations bill section 9156, it reads as follows:

> The energy, educational, and medical facilities listed in Amendment No. 37 of the conference agreement on H.R. 5373, an act making appropriations for energy and water development for the fiscal year ending September 30, 1993, and for other purposes, as reported and filed by the committee of conference on September 15, 1992, in the House of Representatives for which the sum of $94,800,000 included therein for such facilities are hereby authorized and that sum as named in the appropriation shall be available only for these facilities. . . .

Here we go again. The only way we can stop this at this time is with a "no" vote on the rule. I compliment Chairman BROWN for taking the leadership on this issue again today as he did not too many days ago on September 17.

To borrow another witticism from Yogi Berra, "It isn't over until it's over." But we hope to repeat the same kind of vote today that we had just a short couple of weeks ago to reassert the position of the House that these 10 specific projects should not move forward in this fashion.

Mr. BROWN. Mr. Speaker, will the gentleman yield?

Mr. PENNY. I yield to the gentleman from California.

Mr. BROWN. I thank the gentleman for yielding.

Mr. Speaker, earlier the gentleman from Michigan [Mr. TRAXLER] asked an inappropriate question that was not really relevant. But what he meant to ask was what is the status of the authorization for the energy projects. That will be up before us next in the energy bill that we will vote on later today.

I will tell the gentleman that there is nothing in that authorization bill that has any of these projects in it. Those projects have never been introduced nor sought an authorization.

So the whole process here falls because of the fact that these gentlemen on the Committee on Appropriations, my dear friends—or some of them used to be—have thought that they in their wisdom can proceed to authorize and appropriate those projects that will benefit that selected group of appropriators who need projects in their districts.

Mr. FROST. Mr. Speaker, for purposes of debate only, I yield 2 minutes to the gentleman from Texas [Mr. STENHOLM].

(Mr. STENHOLM asked and was given permission to revise and extend his remarks.)

Mr. STENHOLM. I thank the gentleman for yielding.

Mr. Speaker, I, too, join our colleague, the gentleman from California [Mr. BROWN], in urging a "no" vote on this rule. It will not slow up the process of us getting out of this body over a minute or two at the most. You know, last week we had a vote here concerning modified line-item veto. If we ever have had living proof for having this piece of legislation—it passed 312 to 97 in this body, but the other body will not even take it up.

Now, we have an opportunity today, and some will say, "Oh, it is only $95 million." It is $95 million that we can save by going back to the Committee on Rules and striking these unauthorized projects.

You know, let us think in terms—this whole bill we are considering is borrowed money, every penny we are talking about. Yet we find ourselves compelled now, and I think it is fair to say that most of the problem is not in this body, it is in the other body; but be that as it may, we can only deal with these problems when they surface.

I am on the Committee on Agriculture. Had it not been for Mr. BROWN bothering to look into this and then knowing what he was looking for, because I, even after looking at it, had a hard time understanding what we had done. But after hearing him explain it, it is very clear.

We were being asked to overturn the vote where this body has specifically said we are not going to fund these programs because they are unauthorized; all of a sudden we are going to do it, unless we vote against this particular rule.

Now, we have had a lot of votes this year. We have not accomplished a heck of a lot on balancing our budget; $95 million is not going to do it either, but it is a small step in the right direction.

Let us vote down this rule, let the Rules Committee go back and strike this waiver and any other waivers of similar nature that we have in this bill, and let us pass a defense appropriations bill and get on with our business.

Mr. SOLOMON. Mr. Speaker, I continue to reserve the balance of my time.

Mr. FROST. Mr. Speaker, for purposes of debate only, I yield 2 minutes to the gentleman from Ohio [Mr. PEASE].

(Mr. PEASE asked and was given permission to revise and extend his remarks.)

Mr. PEASE. Mr. Speaker, I rise to associate myself with the remarks and with the outrage expressed by Chairman BROWN, Mr. VALENTINE, and several other Members today.

You have heard it before. I will repeat again: Just 3 weeks ago we voted 250 to 104 to strike 10 projects costing $95 million which had never been authorized.

Now, those 10 projects are back again in an unrelated, nongermane bill. There are egregious errors here in two respects:

One, the conference committee for putting these nonrelated amendments in the conference report; and, second, to the Committee on Rules for protecting them with waivers.

It is hard to believe that the Committee on Rules would do that to this House. As Members know, I am leaving, retiring at the end of this session.

I made a point a year ago when I made my announcement of telling people I was doing so not because I was disillusioned with the House at all. But this is exactly the kind of procedure which makes the American people disillusioned with the U.S. Congress. We must not allow this to happen.

Vote "no" on the rule. The Rules Committee will take a grand total of 5 minutes to report back a revised rule.

Three weeks ago, 250 of us voted to stop this kind of travesty. Let us vote that way again.

Mr. SOLOMON. Mr. Speaker, I yield back the balance of my time.

Mr. FROST. Mr. Speaker, I yield back the balance of my time and move the previous question on the resolution.

The previous question was ordered.

The SPEAKER pro tempore. The question is on the resolution.

The question was taken; and the Speaker pro tempore announced that the ayes appeared to have it.

Mr. PEASE. Mr. Speaker, I object to the vote on the ground that a quorum is not present and make the point of order that a quorum is not present.

The SPEAKER pro tempore. Evidently a quorum is not present.

The Sergeant at Arms will notify absent Members.

The vote was taken by electronic device, and there were—yeas 250, nays 171, not voting 11, as follows:

[Roll No. 472]

YEAS—250

Abercrombie
Ackerman
Alexander
Anderson
Andrews (NJ)
Annunzio
Anthony
Applegate
Aspin
Atkins
AuCoin
Baker
Bateman
Berman
Bevill
Bilbray
Blackwell
Bonior
Borski
Boucher
Brewster
Brooks
Broomfield
Bruce
Bryant
Bustamante
Byron
Callahan
Campbell (CO)
Cardin
Carper
Carr
Chapman
Clay
Coleman (TX)
Collins (MI)
Combest
Conyers
Cox (IL)
Coyne
Darden
Davis
de la Garza
DeFazio
DeLauro
DeLay
Dellums
Derrick
Dicks
Dixon
Donnelly
Durbin
Dwyer
Dymally
Edwards (TX)
Erdreich
Espy
Evans
Fascell
Fazio
Fields
Fish
Flake
Foglietta
Ford (MI)
Ford (TN)
Frank (MA)
Franks (CT)
Frost
Gallo
Gaydos
Gejdenson
Gekas
Gephardt
Geren
Gibbons
Gilman
Gonzalez
Goodling
Gordon
Green
Guarini
Hall (OH)
Hamilton
Hansen
Harris
Hatcher
Hayes (IL)
Hefner
Hertel
Hoagland
Hobson
Hochbrueckner
Holloway
Horton
Hoyer
Huckaby
Hughes
Hunter
Hyde
Jefferson
Johnston
Kanjorski
Kaptur
Kasich
Kennedy
Kennelly
Kildee
Kleczka
Kolter
Kopetski
Kostmayer
LaFalce
Lantos
Lehman (CA)
Lehman (FL)
Lent
Levine (CA)
Lewis (GA)
Livingston
Lloyd
Long
Lowery (CA)
Lowey (NY)
Machtley
Manton
Markey
Marlenee
Martin
Martinez
Matsui
Mavroules
Mazzoli
McCloskey
McCrery
McCurdy
McDade
McDermott
McEwen
McGrath
McHugh
McMillan (NC)
McNulty
Mfume
Miller (CA)
Miller (OH)
Mink
Moakley
Molinari
Mollohan
Montgomery
Moran
Morella
Murphy
Murtha
Myers
Nagle
Natcher
Neal (MA)
Nichols
Nowak
Oakar
Oberstar
Ortiz
Oxley
Pallone
Panetta
Parker
Pastor
Paxon
Payne (NJ)
Pelosi
Perkins
Peterson (FL)
Peterson (MN)
Pickett
Pickle
Quillen
Rahall
Rangel
Reed
Regula
Richardson
Rinaldo
Roe
Roemer
Rogers
Ros-Lehtinen
Rose
Rostenkowski
Roukema
Rowland
Roybal
Russo
Sabo
Sanders
Sangmeister
Santorum
Sarpalius
Savage
Saxton
Scheuer
Schiff
Schumer
Serrano
Sharp
Shuster
Sisisky
Skeen
Skelton
Slattery
Slaughter
Smith (FL)
Smith (IA)
Smith (NJ)
Smith (TX)
Snowe
Solarz
Spratt
Stallings
Stokes
Studds
Sundquist
Swift
Tallon
Tauzin
Taylor (MS)
Thomas (GA)
Thornton
Torres
Torricelli
Towns
Traficant
Traxler
Unsoeld
Vander Jagt
Visclosky
Volkmer
Vucanovich
Walsh
Weldon
Wheat
Whitten
Williams
Wilson
Wise
Wyden
Yatron
Young (AK)
Young (FL)

NAYS—171

Allard
Allen
Andrews (ME)
Andrews (TX)
Archer
Armey
Bacchus
Ballenger
Barrett
Barton
Beilenson
Bennett
Bentley
Bereuter
Bilirakis
Bliley
Boehlert
Boehner
Browder
Brown
Bunning
Burton
Camp
Campbell (CA)
Clinger
Coble
Coleman (MO)
Collins (IL)
Condit
Cooper
Costello
Coughlin
Cox (CA)
Crane
Cunningham
Dannemeyer
Dickinson
Dingell
Dooley
Doolittle
Dorgan (ND)
Dornan (CA)
Dreier
Duncan
Early
Eckart
Edwards (CA)
Edwards (OK)
Emerson
Engel
English
Ewing
Fawell
Feighan
Gallegly
Gilchrest
Gillmor
Gingrich
Glickman
Goss
Gradison
Grandy
Gunderson
Hall (TX)
Hammerschmidt
Hancock
Hastert
Hayes (LA)
Hefley
Henry
Herger
Hopkins
Horn
Houghton
Hubbard
Hutto
Inhofe
Ireland
Jacobs
James
Jenkins
Johnson (CT)
Johnson (SD)
Johnson (TX)
Jones
Jontz
Klug
Kolbe
Kyl
Lagomarsino
Lancaster
LaRocco
Laughlin
Leach
Levin (MI)
Lewis (CA)
Lewis (FL)
Lightfoot
Luken
McCandless
McCollum
McMillen (MD)
Meyers
Michel
Miller (WA)
Mineta
Moody
Moorhead
Morrison
Neal (NC)
Nussle
Obey
Olin
Olver
Orton
Owens (NY)
Owens (UT)
Packard
Patterson
Payne (VA)
Pease
Penny
Petri
Porter
Poshard
Price
Pursell
Ramstad
Ravenel
Ray
Rhodes
Ridge
Riggs
Ritter
Roberts
Rohrabacher
Roth
Sawyer
Schaefer
Schroeder
Schulze
Sensenbrenner
Shaw
Shays
Skaggs
Smith (OR)
Solomon
Spence
Staggers
Stark
Stenholm
Stump
Swett
Synar
Tanner
Taylor (NC)
Thomas (CA)
Thomas (WY)
Upton
Valentine
Vento
Walker
Washington
Waters
Waxman
Wolf
Wolpe
Wylie
Yates
Zeliff
Zimmer

NOT VOTING—11

Barnard
Boxer
Chandler
Clement
Cramer
Downey
Lipinski
Mrazek
Sikorski
Stearns
Weber

□ 1443

Messrs. RAVENEL, SPENCE, MCMILLEN of Maryland, and NEAL of North Carolina, Mrs. JOHNSON of Connecticut, and Mr. THOMAS of California, changed their vote from "yea" to "nay."

Messrs. VOLKMER, ATKINS, KENNEDY, STUDDS, CALLAHAN, MARLENEE, and MCCURDY, and Ms. ROS-LEHTINEN changed their vote from "nay" to "yea."

So the resolution was agreed to.

The result of the vote was announced as above recorded.

A motion to reconsider was laid on the table.

PROVIDING FOR PREPARATION OF OFFICIAL DUPLICATES OF CERTAIN LEGISLATIVE PAPERS

Mr. MOAKLEY. Mr. Speaker, I send to the desk a privileged concurrent resolution, House Concurrent Resolution 376, providing for the preparation of official duplicates of certain legislative papers, and ask for its immediate consideration.

The Clerk read the concurrent resolution, as follows:

H. CON. RES. 376

Resolved by the House of Representatives (the Senate concurring), That the Clerk of the House of Representatives and the Secretary of the Senate each shall prepare, sign, and furnish to the other as appropriate, official duplicates of the papers of the two Houses on the following bills and resolutions of the One Hundred Second Congress: H.R. 5400, H.R. 6194, H.R. 5427, S. 2532, S. 1985, S. 1002, S. 893, S. 1569, S. 225, S. 758, S. 759, S. 1146, and S. 2661. Each official duplicate shall be in a form certified by the Clerk or the Secretary to be true. An official duplicate certified as

SELECTED INFORMATION FROM SS&T COMMITTEE'S SURVEY OF COLLEGES AND UNIVERSITIES RECEIVING EARMARKS IN FY93 APPROPRIATIONS BILLS

NAME OF INSTITUTION	AGENCY APPROP	TYPE OF PROJECT	TESTI-MONY	FY93 APPROP	FY92 EARMARK FOR SAME PROJECT	TOTAL EARMARKS THROUGH FY1992[1]	LOBBYIST
Arizona St U[2]	EPA	R·Environmental issues affecting U.S.-Mexico border region	No	2.0M*	2.0M*	14.4M	Advocacy Group
Auburn U[3]	ITA	R·National Textile Center	Yes	7.4M*	8.0M*	6.5M	Hogan & Hartsn
Clark Atlanta U	EPA	R·Cntr for Environmental Policy, Education and Research	No	3.0M	2.5M	12.0M	Cassidy
Clemson U[4]	ITA	R·National Textile Center	Yes	7.4M*	8.0M*	4.2M	
Columbia U	EPA	F·Envrnmental Health Sci Rsrch Cntr-Cntr for Disease Prvntn	Yes	10.0M		9.0M	Cassidy
Delta Col	NASA	F·Science Learning Center & Planetarium	No	8.0M	750K	750K	
Embry-Riddle U	DOT	F·A bi-located engineering & tech center (FL & AZ campuses)	Yes	11.5M			Several+
Fla Intrnatl U[5]	DOT	R·Intermodal Guideway Public Transit Systems Project	Yes	3.0M			
Hahnemann U	DOE	F·Ambulatory Care Research and Teaching Center	Yes	10.0M			Cassidy
Henderson St U	DOT	F·Aviation Academic Center at HSU & aviation lab at airport	No	2.235M			

For "Type of Project," R=Research, F=Facility, and O=Other.

* = Shared funding.

+ = Wm. A. Roberts; Sparkman & Cole; Vierra Assoc, Inc.; Verner Liipfert Bernhard McPherson & Hand Chtd.

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[1] Total earmarks = total for institution from FY 1980-1992, per CRS report.

[2] Consortium--one of five U.S. universities that comprise the S.W. Center for Environmental Research and Policy (SCERP). The remaining four are: New Mexico St U, San Diego St U, U of Texas at El Paso, and U of Utah. The consortium is also comprised of four Mexican institutions.

[3] Consortium member with Clemson Univ, Georgia Inst of Tech, and N C St Univ.

[4] Member of the National Textile Center University Research Consortium.

[5] Consortium member with Univ of South Florida.

NAME OF INSTITUTION	AGENCY APPROP	TYPE OF PROJECT	TESTI-MONY	FY93 APPROP	FY92 EARMARK FOR SAME PROJECT	TOTAL EARMARKS THROUGH FY1992[6]	LOBBYIST
Indiana U	DOE	F·Cancer Treatment Center	No	10.0M	10.0M	34.9M	Sagamore Assoc
Iowa St U	ITA	F·Center for Advanced Technology Development	Yes	2.850M	3.0M	91.6M	
Kansas St U[7]	DOE	R·Plant Biotechnology	Cnsrt	2.5M*	2.5M*	25.1M	
Lamar U-Beaumont[8]	EPA	R·Gulf Coast Hazardous Substance Research Center	Yes	2.5M	2.5M	2.5M	
Louisiana St U	DOE	F·Center for Coastal, Energy & Environ'l Resources	Y-w/o copy	10.0M		71.0M	Hudson, Thomas
Michigan St U	USDA	F·National Food Safety and Toxicology Center	No	4.6M		42.7M	
Middle Tenn St U	DOT	F·Airway science program classroom	Y-w/o copy	556K		250K	
New Mexico St U[9]	EPA	R·Envrnmental issues affecting US-Mexico border	No	2.0M*	2.0M*	5.0M	Advocacy Group
N C State U[10]	EPA	R·Ozone air pollution (Southern Oxidants Study)	**	3.5M*	3.2M*	2.9M	
Oregon Hlth Sci U	DOE	F·Ambulatory Research & Education Building	No	10.0M	10.0M	84.9M	
Oregon St U	NASA	O·Marine Sci Cntr Ocean Currents Distnce Learning Activities	No	500K		22.9M	
Rutgers U	USDA	F·Plant Bioscience Bldg	Yes	2.6M	3.0M	18.6M	Rogers & Wells

** = In President's FY1993 budget.

Cnsrt = Testimony was presented by the Consortium's Executive Director.

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[6] Total earmarks = total for institution from FY 1980-1992, per CRS report.

[7] Member of The Consortium for Plant Biotechnology Research, Inc. (formerly The Midwest Plant Biotechnology Consortium).

[8] Grantor member of consortium which also includes Louisiana St Univ, Miss St Univ, Texas A&M Univ, Univ of Alabama, Univ of Central Florida, Univ of Houston, and Univ of Texas at Austin.

[9] Member of SCERP.

[10] Member of the Southern Oxidants Study (SOS)--a consortium of more than 125 scientists and engineers from 30 public and private institutions involved in long-term research and assessment of ozone in the southeastern United States.

NAME OF INSTITUTION	AGENCY APPROP	TYPE OF PROJECT	TESTI MONY	FY93 APPROP	FY92 EARMARK FOR SAME PROJECT	TOTAL EARMARKS THROUGH FY1992[11]	LOBBYIST
Saginaw Val St U[12]	NASA	F·CIESIN	No	42.0M*	3.4M*	8.1M	J Jordan Assoc & CIESIN
Saint Joseph's U	USDA	F·Center for Food Marketing	Y-w/o copy	2.3M	2.7M	3.3M	Cassidy
San Diego St U[13]	EPA	R·Environmental issues affecting US-Mex border	No	2.0M*	2.0M*	400K	
Tufts U	EPA	R·Center for Environmental Management	Yes	3.2M	3.2M	46.0M	Cassidy
U of Ala at Birm	DOE	F·Biomedical Research Bldg	Yes	10.0M		57.0M	Van Scoyoc Assoc
U of Alaska S Sys	DOT	F·Airway Science Education	No	6.9M		91.2M	Florida Business Assoc
U of CA-San Diego	DOT	R·Composite materials in bridge construction	No	1.6M			
U of Chicago[14]	DOE	R·Plant molecular biology	Cnsrt	2.5M*	2.5M*	139K	
Univ of Conn	DOE	F·Advanced Technologies Institute Bldg	Yes	10.0M		3.8M	
U of Detroit Mercy	EPA	R·Center for Excellence in Polymer	Yes	1.2M	1.0M	1.0M	Cassidy
Univ of Georgia	EPA	R·National UV Radiation Monitoring Center	No	700K		9.9M	Kilpatrick & Cody
Univ of Maine	EPA	F·Geological Sci Bldg (Quaternary Studies Inst)	No	1.0M		2.6M	
Univ of Miami[15]	EPA	R·Ozone air pollution - Southern Oxidants Study	**	3.5M*	3.2M*		Roberts, Wm & Jorden Schulte & Burchette

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[11] Total earmarks = total for institution from FY 1980-1992, per CRS report.

[12] Member of Consortium for International Earth Science Information Network (CIESIN)--a national, non-profit research and applications consortium. CIESIN is comprised of five other universities (U of Mich, Mich St U, Polytechnic U of NY, U of MD, and Utah St U) and a research institute (the Environmental Research Institute of Michigan--ERIM). In addition, the Nat'l Center for Geographic Info & Analysis at U of CA at Santa Barbara is involved.

[13] Member of SCERP.

[14] Member of The Midwest Plant Biotechnology Consortium.

[15] Member of SOS.

NAME OF INSTITUTION	AGENCY APPROP	TYPE OF PROJECT	TESTI-MONY	FY93 APPROP	FY92 EARMARK FOR SAME PROJECT	TOTAL EARMARKS THROUGH FY1992[16]	LOBBYIST
Univ of Mich[17]	EPA	R·Ozone air pollution - Southern Oxidants Study	**	3.5M*	3.2M*	9.0M	
U of Neb-Lincoln	NASA	R·Earth Science Research & Analysis Program	No	400K		25.7M	
U of New Hmpshire	NOAA	F·Biological Sciences Center	No	15.0M		19.0M	
U of New Orleans	EPA	F·Urban Waste Mgmt & Research Center	Y-w/o copy	700K		12.7M	
U of North Dakota	EPA	R·Nat'l Cntr for Excellence on Air Toxic Metals	Y-w/o copy	1.6M		43.4M	
Univ of Oklahoma	DOE	R·Liquefied natural gas as trnsprtation fuel	No	350K		12.5M	
Univ of Oregon	DOE	R·Energy Efficient Industrialized Housing Proj	Yes	1.0M	1.8M	35.2M	Schafer, Jennifer
U of S Carolina[18]	NOAA	R·Urbanizations and Southeastern Estuarine Sys (Mgmt of small high-salinity estuaries)	No	672K		36.8M	
U of South Florida	DOT	R·Intermodal Guideway Public Transit Sys Proj	Yes	3.0M			Advocacy Group
Univ of Utah	NASA & EPA	F·Intermtn Reg'l Netwrk & Sci Computation Cntr	No	10.0M & 5.0M		22.1M	Cassidy & Advocacy Group
U of Wis-Madison	USDA	F·Agricultural Biotechnology & Genetics Bldg	No	2.16M		17.2M	
Wake Forest U	USDA	F·Cntr for Rsrch on Human Nutritn & Disease Prevntn	Yes	3.7M	1.8M	7.6M	Schlossberg, Ken
Wshngtn U-S Louis[19]	DOE	R·Photobio Production Sys for Biodegrdable Polymers	Cnsrt	2.5M*	2.5M*	139K	
Wheeling Jesuit C	NASA	F·Classroom of the Future	No	2.8M	7.5M	29.2M	

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[16] Total earmarks = total for institution from FY 1980-1992, per CRS report.

[17] Member of SOS.

[18] Collaborative effort between Univ of S.C. and NOAA in Charleston, S.C.

[19] Member of Midwest Plant Biotechnology Consortium.

NOV 22

Office of the President

Boston University
147 Bay State Road
Boston, Massachusetts 02215

November 21, 1994

The Honorable George E. Brown
Chairman
Committee on Science, Space, and Technology
U.S. House of Representatives
2320 Rayburn House Office Building
Washington, D.C. 20515-6301

Dear Chairman Brown:

I have received your letter of October 14, requesting some additional information related to my testimony before the Committee on Science, Space, and Technology on September 22, and asking me to reiterate some information that I had already conveyed. I enclose the answers along with a corrected copy of my testimony.

Yours sincerely,

John Silber

Enclosures

want to extend every courtesy to you, and if they can be here we will recognize them to say some nice words about Texas.

Mr. COVINGTON. Thank you, sir.

The CHAIRMAN. All right, Dr. Silber, you may proceed.

STATEMENT OF JOHN SILBER, Ph.D., PRESIDENT, BOSTON UNIVERSITY, BOSTON, MASSACHUSETTS; SISTER MARY REAP, PRESIDENT, MARYWOOD COLLEGE, SCRANTON, PENNSYLVANIA; BILLY C. COVINGTON, Ph.D., ASSOCIATE VICE PRESIDENT FOR RESEARCH AND SPONSORED PROGRAMS, SAM HOUSTON STATE UNIVERSITY, HUNTSVILLE, TEXAS; R. SCOTT BEASLEY, Ph.D., DEAN, COLLEGE OF FORESTRY, STEPHEN F. AUSTIN STATE UNIVERSITY, NACOGDOCHES, TEXAS

STATEMENT OF JOHN SILBER, Ph.D.

Mr. SILBER. Mr. Chairman, I appreciate the opportunity to address this committee--Mr. Chairman, I welcome the opportunity to address this committee and thank you for the invitation.

We have submitted a 31-page report to answer the five questions that you have raised. I will not read the report. Obviously, it is impossible for me to summarize it in only 5 minutes.

The CHAIRMAN. Right.

Mr. SILBER. But I will just try to hit some of the salient points.

The CHAIRMAN. You don't need to be rigidly confined to the 5 minutes, Dr. Silber.

Mr. SILBER. Thank you, sir. But I will just try to address the central issues, under the assumption that the entire report will be a part of the record, and I should like to ask that.

The CHAIRMAN. That will be done.

Mr. SILBER. Thank you. Now, Boston University was asked first Why did we seek earmarked funds? First of all, earmarking funds has been one of the ways that the United States gained leadership in physics in all its dimensions, and it was one of the reasons why the United States could prevail in World War II and in the Cold War.

As you know, through earmarking the Manhattan Project was begun at Chicago and Columbia, the Fermi Laboratory was begun at Chicago, the Lawrence Livermore and Los Alamos laboratories under the direction of the University of California, the Radiation Laboratory, the Instrumentation Laboratory, the Lincoln Laboratory at M.I.T., the Jet Propulsion Laboratory at Caltech--all of these were begun during or shortly after the second world war and provided the stimulus by which we achieved greatness in the fields of physics and applied physics and were able to develop such a powerhouse in national defense.

Four supercomputer centers were developed, largely through earmarking, at Princeton, Cornell, San Diego and the University of Illinois.

There are seven national laboratories that are funded by non-peer review at $2 billion a year at M.I.T., Caltech, Chicago, California, Columbia, Johns Hopkins and Harvard. There are 19 Federal-funded research and development centers in this country with $6.3 billion that is done through earmarking, not through peer review.

The Agriculture Department gives out $1.44 billion a year, only 33 million of which is through earmarking.

So, we have just in these programs alone something in the order in excess of $9 billion that is done through earmarking and not through the peer review.

If there were a program by which we could find funding, adequate funding for the scientific and research infrastructure in this country through a national program, it would be wonderful. But, as all of you know, the NSF has in its budget, had in its budget last year less than $50 million by which to support research and instrumentation, and there was pitiful little money there for any kind of construction.

It has been estimated by the National Science Foundation that the shortfall in scientific and research infrastructure in the United States amounts to a deficit of somewhere between $100 billion and $200 billion. If there were to be a national authorization, legislation for scientific and research facilities in an appropriate magnitude, let's say of something well in excess of $50 billion a year, of course, all universities, I believe, and colleges in this country would support that. In the absence of such funds, however, either this country stagnates or we do what we need to do in order to serve the national interest.

So, in answer to question one, Boston University seeks--has sought earmarked funds for the national interest to increase the number and quality of centers at which research and development takes place.

Congress recognized this when it passed the National Science Foundation Act of 1950. It said that one of the purposes was to strengthen research and education in the sciences, including independent research by individuals, throughout the United States and to avoid undue concentration of such research and education.

Now, it was naturally concentrated during wartime, and it had to be, in a relatively few places. But it is very important that we multiply the number of centers of excellence. It is in the national interest to build new centers at universities that are best positioned by virtue of size, location, commitment to excellence in academic standards, and in areas of medicine, law, management, economics, no less than science, to become national centers of excellence.

Boston University meets these criteria, and through three of these so-called earmarked funds the merit that was potential in Boston University has largely been realized.

It is also in the national interest for us to advance United States research and product development in photonics, which, as Congressman Kennedy mentioned, is a $75 billion a year industry now, and over the next 10 years is likely to become an industry of $500 billion to $750 billion.

We have serious international competitors in this field, Japan and Germany, and those governments are making major investments in research in photonics. The United States has been doing virtually nothing until this was identified by the Department of Defense as one of its seven highest strategic initiatives, one of its seven highest priorities, and consequently it is in the national interest that we try to develop these.

In question two you asked what were the benefits of these projects to the university's educational and research mission as well as any related local or State or regional benefits. It benefits our educational mission because, for example, we have the opportunity of integrating programs in physics, engineering, chemistry, biology to focus these sciences collaboratively as they impinge upon one another in the creation of new scientific discoveries that can then be translated into real products.

We're turning the cutting edge of science into marketplace solutions by which products are created either to be used in our national defense or to be sold on world markets. And then, of course, it gives the opportunity for students to master these vital areas of science and technology which are not taught widely in American universities.

It helps our research mission by virtue of this receipt of money to build the infrastructure. We are able then to go out and recruit outstanding scientists as we have done over the last few years as a result of these earmarked funds.

Through earmarking, Boston University, in physics and biology, has been able to hire 125 ~~[illegible]~~ outstanding members of the scientific community, many of whom are members of the National Academy of Science or the National Academy of Engineering, which we never would have had before.

We have been able to use the $56.5 million we received through earmarking on these three projects, and we contributed over $100 million to it, so that the match has been $2.75 for every Federal dollar spent. But in addition, we spend $9 million a year on just faculty salaries for the 125 faculty that we hired.

In the process of having our first science and engineering center, we created four shops in electronics, in instrumentation, and so forth, and in those shops, where we hire 23 superb technicians, we do work for NASA for our space telescope, for the National Science Foundation's South Pole Astronomical Center, for Draper Laboratories, for AT&T Bell Labs, for Harvard, for M.I.T., Maryland, Michigan, Chicago, Utah, Stanford, Colorado State, Pennsylvania, Stony Brook, California-Berkeley, and incidentally even the Republic--not the Republic of China, but the People's Republic of China, Oak Ridge, Brookhaven, Fermilab, the Stanford Linear Accelerator. All of these agencies throughout this country now use the scientific machine laboratories, workshops that we developed at Boston University. So, far from just serving our interest, it has served a national interest.

It has enabled us also to provide 400 to 500 construction jobs. This latest photonics project is a 250,000-square-foot building. We received $16 million of that through earmarking. We are putting $40 million of our own money into this.

It is a part of the urban revitalization in Boston, and also is very important for regional competitiveness because our region is suffering from the defense industry conversion. We closed Fort Devens. We are shutting down many military installations in the Northeast, and this gives us an opportunity of stimulating that economy that would otherwise be more seriously depressed.

There are over 100 small companies in Massachusetts and the Northeast working in photonics, and this gives us the opportunity of focusing their efforts, giving them access to machinery, giving them access to scientific minds that they desperately need but would otherwise be far beyond their capacity.

Now, question number three asked "How does this project relate to the funding agency's mission as well as national goals and priorities?" Well, our funding mission is that of the Department of Defense and photonics is a key element of the DOD's 1992 Defense Technology Plan, one of its seven highest priorities.

Photonics research is designed to provide air, sea and land platforms whereby we can provide faster, lighter, and more effective communications. If you are sending up a guided missile with electronic wiring, that can be totally disrupted by a blast, by any kind of explosion in its vicinity. If it is wired with photonics, the photonics are immune to the magnetic fields that an explosion creates, and consequently it gives those missiles survivability. That is one of the reasons why the Department of Defense is interested in this.

Moreover, photonic wiring is much lighter than copper wiring. It also provides faster computer processing, and it provides novel sensing, recognition and engagement capabilities that are important in the solving of four core problems key to national defense.

The first is the development of wideband gap semiconductor materials for high density optical data storage. Now, to try to unpack that, they are looking for a blue laser. They are looking for a blue laser that can see farther into water, that can see farther into opaque materials of the sort that you have in the atmosphere. ~~This blue laser is~~ We have developed a blue diode and it is now in operation at Boston University. It is a promising source for the creation of blue lasers. It is one of two existing in this country, and the only other place it exists is in Japan. This will enable us to search and track functions in water far more effectively than otherwise.

We are also developing new biomolecular materials, including materials for the detection of chemical and biological warfare agents. If we can have some biomolecular materials that can sense the presence of poison gas or the presence of other pollutants that could destroy men on the battlefield or could destroy civilian populations, that is an enormous advantage and it is part of the importance of this photonics research.

The third problem is environmental sensing and photocatalysis, including mechanisms for the destruction of pollutants and the mitigation of chemical hazards. We have discovered that there are some biological properties and some light properties that catalyze these poisonous elements and transform in the process of shining light on them into something far less harmful.

Discovering the right kind of light by which you can detoxify poisonous materials or environmentally hazardous materials is of great national importance, not only militarily but also in terms of civilians.

Photonic links among supercomputers is are very important. If we can link computers, let's say in Boston and Washington, D.C., and Seattle through photonics, by a linkage that goes with the speed of light, this will greatly increase not only the power of computers but their survivability in case of war, because then you don't have to locate your computer facilities all in one place where they are close to one another.

And this is one of the reasons, by the way, for microscopic computer design. They're trying to make them smaller and smaller because as they get smaller they get faster. By the use of photonic linkage, we can create speed. As you know, 186,000 miles per second is pretty fast, and that is the potentiality of photonic linkage.

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Now, a photonics center contributes to other national needs. We're developing dual-use technologies, technologies that are important to the Department of Defense, but that are equally or perhaps even more important to civilian commercial and industrial applications.

This increases the value of investment capital by all of these small companies, or even large companies, by reducing the R&D time, by reducing the cost of R&D since it is now taken over by university functions.

It also reduces risk and wasted effort. And most important, it reduces the time of basic discovery to the point where you reach the market with a new product. And last but not least, we are training students who know how to do these things and will be qualified to enter American industry contributing their knowledge and know how of the linkage between science and products in a way that we've never had before.

Fourth, you asked the protocol we've developed with the Department of Defense to monitor progress. Well, the Department of Defense is properly all over us and we are working closely with them.

They have to give approval for all of our equipment purchases. We file justifications for all major subcontracts and they have to review those. We submit an annual technical report. We submit a final technical report. And we submit a final financial status report on how every penny has been spent and what's been done with it.

There are also voluntary protocols. Those that I have listed above were stipulated under the contract. The voluntary protocols that we've developed are as follows:

We submit quarterly technical and program reports. We solicit counsel from the Department of Defense grant monitor. We meet with the DOD grant monitor for discussions of the grant at regular intervals. We work with the Boston regional office of the granting agency. We give briefings to DOD, NASA and many State and industrial organizations on the Photonics Center and on its activities, and we also meet with companies and encourage their collaboration with us.

We coordinate with the EPA and other State and local agencies to ensure that the Boston University and the DOD are complying with all pertinent Federal, State and local statutes.

Your final question was the reasons that we believe have led to proliferation of academic earmarking and what procedures need to be established to address this situation. Well, it won't surprise you to note that I don't believe anything needs to be done about earmarking per se, because I believe it is the right way for Congress to address problems that otherwise would simply go unattended to.

As I said earlier, if we had a procedure by which to support scientific and research infrastructure in a magnitude sufficiently large, $100 to $200 billion is needed, if we had that then there would be alternatives.

Right now we are not in any competition on peer review because peer review has never been used with regard to research facilities and basic instrumentation. That has been done by earmarking right along.

Peer review is used for the determination of which individuals should receive research grants on the basis of their individual scientific competence, and on that score we firmly believe in supporting peer review, and indeed we've done so.

At Boston University when I came there we were doing $12 million a year in peer review research. Today, we do $146 million a year in peer review research. At the time that--in physics, biology and engineering at the time our first earmarked grant was given in 1985 we were doing approximately $5 million of peer review research in those departments. Today, those departments are doing $21 million in peer review, in less than 9 years, because of the way in which the acquisition of the infrastructure enabled us to hire the truly outstanding scientists.

Now, out of the total amount of money spent on research and science and development of about $76 billion a year, the grant to Boston University of $29 million is what I believe the Congress refers to as decimal dust. Well, at Boston University we've turned decimal dust into diamond dust for the benefit of this country. We have more than matched it and we continue to match it by the acceleration and improvement of our faculties.

The modern structure of American science exists because of congressional decisions to invest in technology. I reviewed those at the beginning. The opponents of earmarking are simply bent on protecting their own piece of the pie. The AAU has members whom I listed above, you all know them, M.I.T., Caltech, Chicago, Columbia, Johns Hopkins, Cornell, and so forth. They're all great beneficiaries of earmarked funds, but they're also great beneficiaries of NSF peer review funds and they would naturally prefer it if they had no competitors.

As we have these grants and we enter the competition for NSF funds on peer review, we improve the quality of peer review. We increase the competition for peer review. We put more and better scientists into the game for peer reviewed funds.

Now, if I were a member of the establishment, I would vote to exclude all new members. Perfectly understandable. But at Boston University we are determined to get into the establishment, and we have found that earmarking was a highly effective way to do it.

And I would say that a congressional procedure that gets such good results as the results I have described from the earmarking of funds to Boston University has much to commend it. It has much to commend it on the basis of merit, not on

Boston University Response to Additional Questions Concerning Academic Earmarking

General Questions about University Finances

1. *Please provide (a) the names of all professional lobbying firms or professional representatives employed since 1980 to represent Boston University (BU) with the Federal Government; (b) by year and by firm, payments made to these lobbying firms or professional representatives; and (c) what tangible results BU has seen from these expenditures, including the Congressional appropriation of any awards.*

(a) Cassidy & Associates, Washington, D.C.

(b) 1980--$0
1981--$218,416
1982--$366,869
1983--$435,875
1984--$524,168
1985--$554,814
1986--$481,103
1987--$502,563
1988--$638,588
1989--$579,162
1990--$785,405
1991--$675,871
1992--$686,258
1993--$723,746
1994--$729,535

(c) See President Silber's written statement, entered in his testimony of September 22, 1994, pp. 3-5, 24-27, and President Silber's oral testimony, pp. 18-21. The value of Cassidy & Associates' services to Boston University, however, goes well beyond the specific issues referred to there. The firm tracks and reports on state and federal legislation and regulatory matters of concern to the University, assists us in long-range planning and public relations efforts, provides guidance on immigration issues that affect Boston University faculty members, helps Boston University identify research funding opportunities from government and private programs, and identifies opportunities for University officials to testify before Congressional Committees on matters affecting higher education. The fees Boston University pays to Cassidy & Associates represent payment for the entire range of services the firm provides, not soley for the firm's assistance in obtaining federal funds.

2. *Please describe the process by which BU received its three earmarks (in FYs 1982, 1988, and 1992)--for example, conception of the project, contacts with Congress, and discussions with the funding agency?*

   In each case, Boston University originated a proposal, sought the assistance of Cassidy & Associates, and presented the proposal to members of the Massachusetts Congressional delegation and other interested parties in Congress. In the case of the first two grants, discussions with funding agencies began after the Congressional appropriation. In the case of the third grant, the University followed the instructions of the Secretary of Defense to work with the Office of Naval Research during a period while the proposal was still under review.

3. *What is the total value of all research awards received by BU by year since 1980? Please provide the proportion of federal, state, and private funding (please indicate whether the dollars used are constant or current).*

   Please see Attachment 1, "Boston University Grant and Contract Awards, FY81--FY94." The dollars used are the actual amounts of awards, not constant or current dollars.

4. *What are the total indirect cost charges BU has received from the Federal Government for every fiscal year since 1980? How much did BU set aside for facility renovation and maintenance in those years? How much do the three earmarked facility projects contribute to the indirect cost charges and facility set-asides at BU? (Please indicate whether the dollars are constant or current.)*

   In the cases of the 1984 grant and the 1988 grant, Boston University received no indirect cost recovery and so, of course, had nothing in the way of indirect cost charges to "set aside for facility renovation and maintenance." The Committee's question reflects some incorrect assumptions. Because the first two grants did not include programmatic funds, they therefore did not provide any reimbursement of indirect costs. In the third grant, $13 million of the $29 million appropriation is for programmatic costs. The University collected indirect costs at the rate of 62 percent for FY 1994, which totalled $285,413. (The indirect cost rate will be 65 percent in FY 1995 and 67.5 percent in fiscal year 1996.) As the Photonics facility is under construction and because, by law, the University cannot set indirect cost funds aside for use in future years, none of these funds is "set aside for facility renovation and maintenance."

5. *What has been BU's annual operating budget since 1980 (please indicate whether constant or current. dollars)? Please indicate the sources of support in that budget (i.e., state, endowment, private gifts, federal, etc.).*

Please see Attachment 2, "Boston University Operating Budget, Fiscal Years 1980 to 1994."

6. *What is BU's endowment?*

$346,908,899 as of June 30, 1994.

Questions Specific to Certain Earmarks

7. *In FY 1984, BU received $19 million for the renovation, construction, and equipping of an Engineering and Technical Training Center. The Government (through P. L. 98-396) provided these funds as a demonstration project under Section 301(f) of the Public Works and Economic Development .Act of 1965. Justification for the project was as an enhancement of BU's ability to train the youth of Boston and New England to help meet the growing demand for technically trained personnel in the area's economy.*

- *What has been the impact of this demonstration project on the area's economy? Please supply supporting documentation from either BU or the Department of Commerce.*
- *How did BU justify the need for increased technical training capacity in the Boston area? Please provide supporting documentation.*

As John Silber pointed out in his testimony, the economic impact of this project can be assessed in several ways, (see Written Testimony, pp. 3-7, 24-27; Oral Testimony, pp. 18-24). The project's considerable impact on the area's economy is best understood in the context of local trends in urban development and in employment. Second, the creation of new research and development capabilities established the basis for future economic development in the region. New training and research facilities in the sciences and engineering produce the human capital and the ideas that reach the larger economy in the form of additional highly-skilled technical and professional workers, new and enhanced products and services, and an expanded and more diverse ecology of high-tech specializations. As John Silber testified (Oral Testimony p. 19), Boston University hired 125 new scientists as a result of the grants made by Congress for our initiatives in physics and biology. As he went on to note (Written Testimony, pp. 6-7; Oral Testimony, pp. 19-20), Boston University also constructed four specialized scientific machine shops, whose clients include Harvard University and M.I.T. This is one demonstration among many that, despite the concentration of advanced scientific facilities in the region, there were important needs that had previously gone unmet.

The short-term impact on the area's economy included labor-related expenditures during construction amounting to approximately $2.3 million. The impact of this construction was magnified by the recent history of the area adjacent to the construction site. Much of the surrounding neighborhood (to the east in the Kenmore Square business district, a major transit nexus; and to the south, in Audubon Circle, a residential area) had deteriorated over the previous two to three decades. Boston University had already taken major steps to spur the redevelopment of these two districts. In Kenmore Square, we purchased and renovated a centrally located building in a $10 million project to create the largest bookstore in New England, in an effort to provide an anchor commercial facility around which the Kenmore business district could be re-established. In the Audubon Circle area, at the urging of the City government, the University purchased a number of deteriorated apartment buildings, many of which were vacant and abandoned, and renovated them for use as student housing and commercial apartments. This effort led to further redevelopment in the neighborhood by private developers and owners, and today the neighborhood is a vastly improved residential area.

The long-term impact on the area's economy demonstrates the value of siting new training facilities in areas that may, superficially, appear to be already adequately served. The economy of much of New England, and in particular the economy of Massachusetts, centered in the Routes 128 and 495 area surrounding Boston, is based on knowledge and ideas that are produced within the region's universities. As with Silicon Valley in California and the Research Triangle in North Carolina, the area surrounding Boston is an economic force that contributes greatly to America's competitiveness in the world economy. This competitiveness is based on technological leadership that stems directly from the research efforts of universities, including Boston University. The health of this sector of the economy is based on the availability of well-trained workers at all levels, on the constant flow of new ideas, and on the diversity of high-tech specializations within universities and industries, which enables the players to draw efficiently on each other's strengths. This project at Boston University contributed to all three of these factors.

At the time this project was funded, the percentage of college students in America studying the physical sciences had fallen by half since 1965, and only six percent of American college graduates were engineers, the lowest percentage of any industrialized nation in the world. In 1984, it was projected that the nation would have 47,000 new jobs for engineers each year through 1990, a number that was greater than the demand for new doctors and lawyers combined. The demand for new computer scientists, and for skilled researchers in physics, chemistry and biology was also expected to grow. In order to meet the needs of students, faculty, and the prospective employers of our graduates, we needed to enhance and augment our existing facilities. We could not train the engineers and scientists who would lead us into the twenty-first century in labs and classrooms that had been constructed prior to 1950.

The economic impact of the new facilities at Boston University can be extrapolated in part from the measure of grant and contract activity of the faculty who use these facilities. Of course, the current and future impact of the results of their research is far beyond the scope of this response and indeed of our ability to measure. As new ideas and refinements of earlier developments leave the researchers' laboratories and enter the marketplace, the full economic impact of that research activity is shared among many companies and consumers throughout the nation.

The sciences and engineering are a major element of what makes this a great university. A look at the overall impact of Boston University, in the area and beyond, may be in order. Please see Attachment 3, "Making a Difference: Economic and Social Impact Source Book."

8. *In FY 1988, BU received an earmark for the Institute for Advanced Physics. The purpose of the facility was to "maintain and expand high quality specialized research..."*

   - *Please list all Principal Investigators that have offices and or laboratories in the structures that were either built or renovated with the earmarked award and what Federal research awards they have received since moving into the built or renovated structures--the amount and duration of the award, the source of funding (e.g., the Department of Energy), and all Principal Investigators listed on the award, and a short description of the topic of research.*

Please see Attachment 4.

- *BU used the FY 1988 award to build a new Physics building, add two floors to an existing facility, and renovate a building used for research and teaching biology, according to documents provided by the Department. Was Congress aware that the earmark was for each of these facilities expenditures when the initial request for an appropriation was made? Please provide documentation supporting your answer.*

The question falsely implies that these are three separate facilities. In fact, they are parts of a single facility, as was clear from the title page and the text of the original proposal submitted to Congress. Thus, the answer to the question, "Was Congress aware....," is yes. Please see Attachment 5, from "A Proposal to Establish an Institute for Advanced Physics Research."

- *At the time that Congress provided the FY 1988 award, was there a dearth of physics teaching and/or research capacity in the United States, the Northeast Region, or the Boston area in particular? If yes, please provide data supporting your position. How did your institution justify the need for this facility?*

Yes. Please see the original proposal. Some members of the Committee may believe that the physics programs at Harvard and MIT were and are sufficient for New England, but there are few physicists or any other knowledgeable individuals who would share that assessment. In view of the rapid growth of knowledge in this field, and the expansion of core industries based on state-of-the-art physics, it would be foolhardy to imagine that the existing "teaching and/or research capacity" in this discipline was adequate then, or adequate even now, either in New England or in the nation as a whole.

9. *In FY 1992, BU received an earmark in the Defense Appropriations Act for $29 million to build the "Center for Photonics Research." P.L. 102-298 amended the language providing the funds for this project with the addition: "The Secretary of Defense shall review grants. . . specified previously in this title and shall award such amounts as he deems appropriate based on the potential contribution each proposed project may make to the national scientific and technical posture." BU submitted a proposal for evaluation, which was subsequently not recommended or approved for award. DOD then offered BU the opportunity to revise the proposal, with technical assistance from the Office of Naval Research. DOD approved the resubmitted proposal for award in May, 1993.*

- *What assistance did DOD provide BU to revise the BU proposal? Please specify the type of assistance in detail.*
- *How did BU justify the need for increased U.S. photonics research capacity over that already supported by DOD? Please provide supporting documentation.*
- *Please provide all documents concerning the Federal funding of this project after the release of funds in May, 1993.*

(a) The DOD assigned Dr. Hershel Pilloff, Office of Naval Research, to serve as the University's "coach." Dr. Pilloff read the proposal and offered various suggestions for how it might be improved. The University incorporated his suggestions and sent Dr. Pilloff a revised draft of the proposal. Dr. Pilloff then visited Boston University to meet with the photonics research committee that drafted the proposal. During his visit, Dr. Pilloff offered further suggestions. The committee reviewed his suggestions and made further changes in the final draft of the proposal submitted to the Office of Naval Research.

(b) Please see Attachment 6, a copy of the photonics proposal. The Department of Defense acknowledged that it alone could not fund photonics research so as to exploit fully the potential benefits of such research. That is why photonics was highlighted in the DOD's July 1992 Defense Technology Plan and in earlier DOD assessments of technological need. Contractors and research institutions were encouraged to pursue research in these fields so as to identify and fill needs which the DOD realized might otherwise go unaddressed.

(c) See Attachment 7.

10. *Why did the cost of the photonics project grow from the initial proposal? How is the school accommodating that increased cost? If the increased cost represents an amount greater than or equal to the amount of the Federal share of the project, can you explain why Boston University needed an earmark to build the originally proposed building?*

The initial cost of the proposal was the cost of the core projects that are highlighted in the final proposal. Boston University did not have the resources to support these core projects, absent outside sponsorship and funding. The increase in the cost of the Photonics Center was the result of our adding three additional components to the proposal: facilities to support photonics-related research by Boston University faculty members which were not included in the original proposal; facilities, such as testbed laboratories, sought by New England businesses involved in photonics research and development; and facilities to support the technology-transfer and trade development mission of the Center.

This expansion grew out of our efforts to refine the initial proposal. As Boston University circulated drafts of the proposal among faculty members, members of the high-tech business community, and researchers at other institutions, we received many suggestions for how we might improve the plan. We weighed these suggestions carefully and incorporated many of them into the proposal. We also found that we had researchers working on parallel projects, which raised the possibility of expanding the scope of the original proposal to include some areas of research that we had not, at first, recognized as closely allied. In general, the proposal evolved from a focus on a set of particular research projects to a program that included those projects but also aimed to accommodate a wider set of economic and research priorities.

Boston University has accommodated the increased cost of the project by increasing its own contribution (see Written Testimony, pp. 10-11). In the evolution of the proposal, Boston University came to a greater recognition of the important role that photonics will play in basic science and applied technology in the decades to come and adjusted its fiscal priorities accordingly. The result of this investment will be a facility that will be a magnet for peer-reviewed research in photonics and for corporate support--which will justify the University's as well as the Government's investment. We could not, however, have afforded to fund the original project on our own. In appropriating funds for the proposal, Congress too recognized that it had not previously funded research in photonics to the extent justified by the national need and by the field's potential. Priorities change. Just as Congress changed its priorities, so too Boston University decided to invest more of its scarce resources in an area which we believe is central to the University's and the nation's future.

11. *What other earmarks does BU intend to seek in the next three years?*

Boston University is not willing to disclose plans for research projects currently under development. To do so could put the University at a competitive disadvantage in seeking peer-reviewed grants and other sources of funding. Generally speaking, Boston University seeks funding from many other sources before coming to Congress with a request for an appropriation for a specific project.

Questions Specific to Dr. Silber's Written or Oral Testimony on September 22, 1994

12. *Dr. Silber claims that earmarking serves the 'have-not' institutions. Since BU has been among the top-40 recipients of Federal R&D funding in*

the 1990s, why do you consider BU to be among the "have-not" universities? How do you define "have-not" universities?

John Silber responds:

I define "have-not" universities as those with too few resources to compete, without special assistance, with the universities that are either very wealthy or which receive massive and regular government assistance. Boston University is a have-not university for two reasons. First, it is not a state university. It does not and cannot rely on a state government to fund its capital costs, as do state universities. Second, Boston University's endowment of $11,770 per student is extremely low. Among our local competitors, Harvard has an endowment of over $275,000 per student and MIT has an endowment of over $162,000 per student. Even small colleges which do not have a major commitment to research in the sciences frequently have per-pupil endowments many times the size of Boston University's. For example, Wellesley College has an endowment of nearly $200,000 per student. The result of Boston University's low endowment is that Boston University must cover a high proportion (54%) of its operating costs from tuition. It does not have the resources for capital projects that are characteristic of the "have" universities.

As I pointed out in my testimony, the universities that are now "haves" got that way, in large part, because they were the exclusive recipients of massive federal earmarks between 1940 and about 1965, and they have continued to this day to be in a class by themselves in annual non-peer-reviewed federal grants (Written testimony, pp. 12-14; Oral testimony pp. 15-18). Boston University, by contrast, has received very modest federal support in the form of direct Congressional appropriations, and those were awarded only in the last decade (1984-1994). During that time, the amount of peer-reviewed sponsored research awarded to Boston University faculty members has more than doubled (from $70.3 million to $150.2 million). Mr. Chairman, if Congress were to award Boston University grants in the magnitude that it has awarded to our competitors, and if Congress were to make those grants with the regularity that it has made those grants to our competitors, I would guarantee that Boston University would very quickly become one of the top two or three research universities in the world. Until that time, Boston University will continue to seek Congressional appropriations to meet the critical need for new scientific and research facilities.

13. *Dr. Silber claims that BU has contributed $2.76 for every Federal dollar in earmarks. However, there is no documentation of such cost-sharing in the proposal or follow-up material for any of BU's three earmarks. Please*

provide the Committee with the appropriate data detailing this cost-sharing.

The information is in John Silber's oral testimony (pp. 3-4) and Boston University stands by it. Boston University has invested huge amounts of its own resources in these projects. The details are in the University's audited financial statements.

14. *Several times in your oral testimony, you referred to a "one-hundred to two hundred billion dollar" crisis in academic infrastructure. Could you please provide a source for this number.*

John Silber responds:

According to a joint report of the Association of Physical Plant Administrators of Universities and Colleges and the National Association of College and University Business Officers in cooperation with Coopers & Lybrand, "America's deteriorating college and university facilities require....an estimated $60 to $70 billion in capital renewal and replacement needs, some $20 billion of which is urgent or priority in nature." Note that these figures were compiled five years ago, in 1989. Also, the authors state that, "This study was only a start at quantifying and tracking the need. Much more work needs to be done."[1] The $60 billion to $70 billion estimate applies only to renewal and replacement of facilities and does not address the need for expansion and for new facilities. The latter are extremely important for the newly-emerging scientific disciplines. Facilities for cognitive and neural science, nanotechnology, robotics, and planetary science--to mention only a few of the burgeoning new areas of human knowledge--are not even contemplated in that list. An estimate of a $200 billion crisis in academic infrastructure is, if anything, too low.

15. *Mr. Hoke inquired about efforts to fund the Photonics Center prior to seeking an earmark. Could you please provide a description of those efforts.*

John Silber responds:

Please see descriptions given in my oral testimony, pp. 77-82 and pp. 9-10 of my written testimony. In 1987, after a group of interested faculty members tried and failed to identify an appropriate funding source for a center for photonics research, The Provost of Boston University forwarded a copy of the proposal to Cassidy & Associates with a request for help in identifying any federal agency which might have appropriate peer-reviewed funding programs to which the proposal could be submitted. After a thorough investigation, Cassidy & Associates responded that it was unable to identify any such source, but said that it would continue the search. In the course of the next two years, faculty members at Boston University pursued discussions with private foundations and potential donors. They found considerable interest among scientists and high-technology businesses, but failed to identify an appropriate funding source.

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[1] Sean C. Rush and Sandra L. Johnson. The Decaying American Campus: A Ticking Time Bomb. Coopers & Lybrand. 1989. pp. 56-57.

At the same time, faculty members at Boston University developed a series of closely related proposals, including a proposal for a Center for the Science and Technology of Intermediate Scale Structures and a proposal to investigate the use of lasers in cardiovascular surgery. The University initially sought only separate funding for these proposals, but as the concept of the Photonics Center expanded, key components of these and other projects were added to the photonics proposal.

Thus the record of our efforts to seek funding for the projects that were included in the final photonics proposal spans seven years (1987-1993) and includes efforts to secure funding for the initial proposal, efforts to secure funding for separate projects that eventually became components of the expanded photonics proposal, and efforts to secure funding for successively revised versions of the original photonics proposal.

Attachments

1. Boston University
Grant and Contract Awards
Fiscal Years 1981-1994

2. Boston University
Operating Budget
Fiscal Years 1980-1994
(Current Dollars)

3. Making a Difference
Economic and Social Impact
Source Book
1994

4. Boston University
Summary of Federal Grant and Contract Activity
Fiscal Years 1990-1994

5. "A Proposal to Establish an
Institute for Advanced Physics Research"
Boston University
Department of Physics

6. Proposal for Center for Photonics Research

7. Documents concerning federal funding for
Center for Photonics Research

Attachment 1

Boston University
Grant and Contract Awards
Fiscal Years 1981-1994

Boston University
Grant and Contract Awards

	Federal		State/Local		Private		Total	
Year	No.	Amount	No.	Amount	No.	Amount	No.	Amount
FY81	432	40,896,963	16	3,785,202	101	3,631,986	549	48,314,151
FY82	367	40,636,998	46	3,442,940	132	5,917,964	545	49,997,902
FY83	379	42,430,440	119	7,697,582	189	9,564,933	687	59 692,955
FY84	422	56,185,624	103	6,276,041	218	7,838,593	743	70,300,258
FY85	430	55,264,062	93	8,442,031	231	8,887,080	754	72,593,173
FY86	443	58,777,194	112	9,019,373	231	10,705,741	786	78,502,308
FY87	513	66 769,121	109	9,624,599	295	12,181,896	917	88,575,616
FY88	588	68 618,245	183	13,003,439	283	11,636,346	1,054	93,258,030
FY89	633	76 625,228	208	10,880,659	279	14,117,819	1,120	101,623,706
FY90	714	78,733,244	64	12,717,477	372	15,652,838	1,150	107,103,559
FY91	745	87,958 065	63	14,531,089	344	18,072 127	1,152	120,561,281
FY92	767	95 076,902	83	16,840,399	371	22,807,325	1,221	134,724,626
FY93	765	96,591,559	68	16,386,841	334	24,046,871	1.167	137,025,271
FY94	820	110,845,156	74	16,135,941	345	23,194,457	1,239	150,175,554

Attachment 2

Boston University
Operating Budget
Fiscal Years 1980-1994
(Current Dollars)

BOSTON UNIVERSITY
Operating Budget (Current Fund Revenues)
Fiscal Years 1980 to 1994
Current Dollars

	1980*	1981*	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Sponsored Programs**															
Federal			34,722,867	34,209,457	36,866,303	38,604,727	44,758,776	46,142,545	45,660,009	50,008,787	52,427,257	53,483,356	60,131,752	63,927,565	65,017,735
State (Massachusetts)			586,262	826,640	2,267,901	3,076,379	3,393,062	3,481,294	3,968,941	4,196,729	5,134,589	3,594,395	1,917,870	2,949,698	2,972,555
Private & Other Government			9,265,410	11,596,707	11,784,036	13,139,151	14,467,983	17,328,925	20,967,825	20,954,580	28,872,350	34,126,111	37,901,185	45,520,135	49,102,510
Total Sponsored Programs	49,552,113	47,465,705	44,574,540	46,632,803	50,918,240	54,820,257	62,619,822	66,952,765	70,596,775	75,160,096	86,434,195	91,203,861	99,950,808	112,397,398	117,092,800
Sponsored Prog Recovery of Indirect Costs															
Overhead															
Federal			8,803,539	10,965,404	14,415,646	14,706,740	17,066,945	18,542,763	19,334,432	19,931,305	21,319,712	21,469,126	21,342,617	25,118,182	24,475,395
State (Massachusetts)			16,194	34,399	98,925	125,847	144,931	98,969	197,522	254,613	93,807	50,384	77,272	66,916	51,057
Private & Other Government			755,130	1,260,789	1,368,523	1,441,350	1,693,402	1,925,840	2,129,169	2,175,094	2,785,168	3,603,849	4,135,995	4,621,882	4,707,602
Subtotal Recovery of Overhead	7,341,343	9,533,603	9,574,863	12,260,592	15,883,094	16,273,937	18,905,278	20,567,571	21,661,123	22,361,013	24,198,686	25,123,360	25,555,884	29,806,980	29,234,054
Fringe															
Federal			2,195,264	2,283,485	2,937,955	2,915,525	3,273,641	3,902,251	4,323,292	4,822,773	5,144,035	4,851,419	5,695,173	7,073,269	7,646,603
State (Massachusetts)			21,697	23,772	163,539	148,933	187,026	123,470	192,488	192,040	98,592	55,022	73,377	90,986	110,937
Private & Other Government			1,660,808	1,927,982	2,243,974	2,330,147	2,411,408	2,966,631	3,868,737	4,130,341	5,284,619	5,632,635	7,082,360	8,918,053	10,539,070
Subtotal Recovery of Fringe	4,228,101	3,388,046	3,877,769	4,235,239	5,345,467	5,394,606	5,872,074	6,992,352	8,384,516	9,145,154	10,527,246	10,539,076	12,850,911	16,082,308	18,296,609
Total Recovery of Indirect Costs	11,569,444	12,921,649	13,452,632	16,495,831	21,228,561	21,668,542	24,777,352	27,559,923	30,045,640	31,506,167	34,725,932	35,662,436	38,406,795	45,889,289	47,530,663
Student tuition & fees	103,532,341	124,265,434	142,749,820	160,184,343	184,659,272	204,071,298	226,136,670	249,223,135	278,627,354	301,573,307	327,729,880	353,148,212	380,419,484	407,289,048	430,233,080
Current gifts	2,106,208	3,140,422	4,455,805	3,840,863	5,370,274	5,914,840	6,980,880	10,349,214	7,885,636	8,077,059	10,004,692	9,733,060	7,798,437	8,205,910	9,881,950
Endowment yield availed of	1,069,557	1,197,790	1,507,100	1,922,473	1,885,814	2,406,152	2,536,588	3,131,773	3,414,555	3,830,461	4,083,509	4,186,052	4,506,829	4,560,320	5,274,570
Sales and services educational	3,126,523	6,460,101	7,432,941	9,596,546	12,170,690	12,273,639	15,484,899	14,979,553	18,984,506	21,883,339	22,435,827	24,946,510	26,282,910	27,577,148	30,900,953
Other gifts and income for student aid	453,320	405,094	421,689	520,493	1,551,270	1,080,580	990,760	915,949	1,185,526	1,475,999	2,268,556	1,500,649	1,709,835	1,943,857	2,322,163
Investment Income	2,695,597	4,612,047	6,949,872	10,004,448	10,106,882	10,252,639	14,978,836	12,456,934	10,779,134	13,846,466	14,238,226	14,507,969	12,875,964	6,022,677	5,623,247
Other income	1,140,329	2,405,108	2,266,989	2,154,144	2,646,636	3,122,199	2,750,555	4,928,780	2,452,970	3,039,360	3,855,112	2,628,183	3,077,022	2,960,871	3,310,683
Auxiliary enterprises	23,646,704	27,467,427	32,358,538	36,357,772	48,776,814	57,717,802	64,496,902	73,340,436	82,244,335	88,994,379	95,025,591	101,454,498	109,748,340	119,497,765	132,926,715
Total Revenue	198,892,136	230,340,777	256,169,926	287,709,716	339,314,453	373,327,948	421,753,264	463,838,462	506,216,431	549,386,633	600,801,520	638,971,430	684,776,424	736,344,282	785,096,824

* Breakdown of sponsored programs revenue, and fringe and overhead recovery not available for fiscal years 1980 and 1981

** Includes student aid derived from grants and contracts

Source Office of the Comptroller, Department of Indirect Cost Analysis and University Blackbook

Analytical Services 11/20/94
C3 Operating Bud FY80-94

Attachment 3
Making a Difference
Economic and Social Impact
Source Book
1994

BOSTON
UNIVERSITY

Making a Difference

Economic and Social Impact Source Book

Fiscal Year 1994

November 1994 Draft

History and Overview • *1*

The Economic Impact • *3*

Sources and Uses of Operating Funds • *5*
Faculty and Staff Earnings • *6*
Employee Benefits • *8*
Purchased Goods and Services • *10*
Student Living Expenditures • *11*
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1 · History and Overview

"In the heart of the city, in the service of the city"
(LEMUEL MURLIN, President of Boston University, 1911 to 1925)

Boston University traces its origins to April 1839 when delegates of the Methodist Episcopal Church founded the country's first Methodist seminary. The seminary was established in Newbury, Vermont; transferred to Concord, New Hampshire in 1847; and to Boston in 1867, when it was chartered anew as the Boston Theological Seminary. In 1869, the officers of the Seminary were granted a charter by the Commonwealth of Massachusetts under the name Boston University.

Today, Boston University is made up of 15 schools and colleges: the School for the Arts, the College of General Studies, the College of Communication, the Goldman School of Graduate Dentistry, the School of Education, the College of Engineering, the Graduate School of Arts and Sciences, the School of Law, the College of Liberal Arts, the School of Management, the School of Medicine, Metropolitan College, Sargent College of Allied Health Professions, the School of Social Work, and the School of Theology. Boston University not only enjoys an outstanding reputation as a center of higher education and research, but also makes a substantial contribution to the City of Boston, the Greater Boston area, and the entire Commonwealth of Massachusetts in the form of jobs and direct spending, and through the many cultural, educational and social services which the University provides to its neighbors.

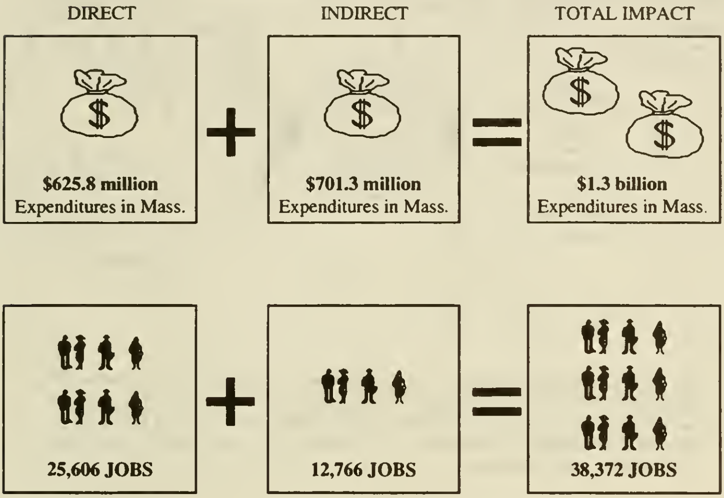
For over a century and a half, Boston University has been a major resource to the City of Boston, the Boston Metropolitan Area, and the Commonwealth of Massachusetts. Local citizens, organizations and businesses benefit from the proliferation of programs and services offered by University faculty, staff, and students. Boston University is proud of its commitment to the community — a commitment to *making a difference.*

The purpose of this report is to broaden community understanding about the significant contribution which Boston University provides to local citizens and businesses through its spending and services. **Section 2** of this report was prepared by an independent consultant using a methodology developed by KPMG Peat Marwick for earlier Boston University studies. Here, the considerable positive economic impact of the University on the City of Boston, the Boston Metropolitan Area and the Commonwealth of Massachusetts is described in detail. In fiscal year 1994, the economic impact on the Commonwealth was $1.3 billion. The University directly employed more than 25,600 people, and the purchase of goods and services resulted in nearly 12,800 additional jobs for the Commonwealth.

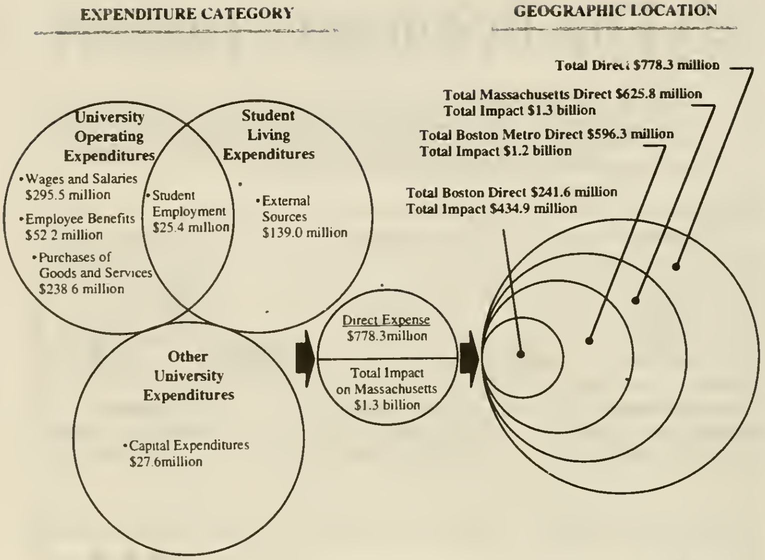
Numerous programs and services offered by Boston University have additional positive economic and social impacts on the area. These include: scholarships for the families of Boston fire fighters; free use of athletic facilities for high school competition and the Special Olympics; voluntary payments in lieu of taxes; tree planting; and the maintenance of sidewalks, streets, and MBTA tracks. **Section 3** is a reference guide to the many programs and services which Boston University provides to the community.

2· The Economic Impact

During fiscal year 1994, Boston University and its affiliates and students expended $778.3 million, including $625.8 million in the Commonwealth of Massachusetts. Econometric factors provided by the U.S. Department of Commerce translate this direct spending into an estimated contribution of $1.3 billion plus more than 38,000 jobs in the Commonwealth.



Of the $778.3 million spent during fiscal year 1994, $320.9 million was for faculty, staff, and student wages and salaries; $52.2 million for employee benefits; $238.6 million for purchased goods and services; and $27.6 million on capital projects. In addition, students brought an estimated $139 million into the area for living expenses. Eighty percent of direct expenditures were made in the Commonwealth of Massachusetts ($625.8 million) of which $596.3 million was spent in the Boston Metropolitan Area, including $241.6 million in the City of Boston.


EXPENDITURE CATEGORY
GEOGRAPHIC LOCATION
University Operating Expenditures
•Wages and Salaries $295.5 million
•Employee Benefits $52 2 million
•Purchases of Goods and Services $238 6 million
Student Living Expenditures
•Student Employment $25.4 million
•External Sources $139.0 million
Other University Expenditures
•Capital Expenditures $27.6million
Direct Expense $778.3million
Total Impact on Massachusetts $1.3 billion
Total Direct $778.3 million
Total Massachusetts Direct $625.8 million
Total Impact $1.3 billion
Total Boston Metro Direct $596.3 million
Total Impact $1.2 billion
Total Boston Direct $241.6 million
Total Impact $434.9 million

The University's impact on the Boston, Boston Metropolitan Area and Massachusetts economies is much greater than the sum of direct University-related expenditures. The University's total economic impact is $434.9 million in Boston, $1.2 billion in the metropolitan area (including Boston) and $1.3 billion throughout the Commonwealth. The "Multiplier Effect" which results in total impact will be described later in this section.

Sources and Uses of Operating Expenses

Total Sources and Uses of Funds by Boston University and its affiliates for fiscal year 1994 are presented in EXHIBIT 1:

EXHIBIT 1

Sources and Uses of Current Funds FY 1994

Sources of Funds ($000)		Uses of Funds ($000)	
Tuition and Fees	$430,233.1	Salaries and Wages to Faculty/Staff[a]	$295,516.0
Sponsored Programs:			
Federal Funding	65,017.7	Employee Benefits[a]	61,166.4
State Funding	3,661.3		
Local Funding	490.7		
Other	47,923.1	Purchases of Goods and Services[a]	235,576.7
Private Gifts and Endowments	17,478.7	Student Employment	25,415.1
		Financial Aid	117,219.7
Sales and Services Departments:		Transfers/Adjustments[b]	49,952.6
Educational	30,901.0		
Investment Income	5,623.2		
Auxiliary Enterprises	132,926.7	Net Increase in Funds Available for General Purposes	250.3
Recovery of Indirect Costs	47,080.8		
Other	3,760.5		
Total Sources	$785,096.8	Total Uses[c]	$785,096.8

(a) Includes contracted auxiliary enterprise services.

(b) This amount includes transfers and adjustments which remain within the University system and thus are not expended in the local economy.

(c) Uses of funds were reconciled to fiscal year 1994 audited financial statements.

Operating expenditures, funded largely from sources outside the Boston Area, have a direct and significant impact on the local and regional economies. For this study expenditures were analyzed and reported in five major categories: Faculty and Staff Earnings; Employee Benefits; Purchased Goods and Services; Student Living Expenses; and University Capital Expenditures.

This report focuses on spending in three geographic areas: Boston; the Boston Metropolitan Area; and the Commonwealth of Massachusetts, and includes data from: wholly-owned subsidiaries (Boston University Bookstore Mall and a real estate holding company); contracted food services (provided by ARA Services); and parking services (provided by Fitz Inn Parking).

Faculty and Staff Earnings

As shown in EXHIBIT 2, Boston University and its affiliates employed 10,881 faculty and staff in fiscal year 1994. Total wages paid to residents of the City of Boston amounted to nearly $61 million. For residents of the Commonwealth of Massachusetts, total earnings were over $280 million. The figures below do not include additional professional, consulting, publishing or lecture income earned by faculty and staff, or supplementary income earned by spouses or other family members.

EXHIBIT 2

Faculty & Staff Earnings FY 1994

Faculty & Staff	**Home Location**					**Total**
	Boston	**Brookline**	**Remainder of Boston Metro Area**	**Remainder of Massachusetts**	**Other**	
Headcount	2,902	920	5,608	575	876	10,881(a)
Direct Salaries/Wages	$60,892,973	$30,366,850	$176,825,293	$12,694,754	$14,736,134	$295.516,004

Total Impact on Boston Metro Area =	$552,737,890	**Total Boston Metro Area Earnings =**	$268,085.116
Total Impact on Massachusetts =	$605,979,113	**Total Massachusetts Earnings =**	$280,779,870

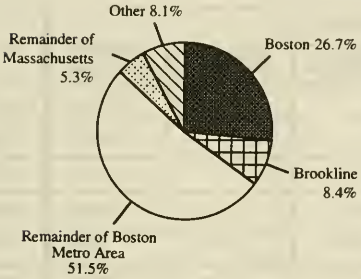
(a) *Faculty and staff headcount includes:*

*University**	9,755
Parking and Food Service Auxiliaries	413
Wholly Owned Subsidiaries	713
	10,881

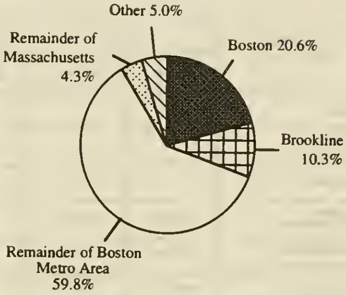
* *Does not include 14,725 students employed by the University (see Section II-E).*

A great majority of Boston University faculty and staff (86.7 percent) live in the Boston Metropolitan Area. They received 90.7 percent of total wages paid by the University.

FACULTY AND STAFF EMPLOYEES BY HOME LOCATION



FACULTY AND STAFF SALARIES AND WAGES



Employee Benefits

Boston University purchased a full range of benefits for its employees at a total cost of $52.2 million. Approximately 40 percent of this cost was spent on Workers' Compensation, Health Insurance, and Unemployment Compensation. As seen below, more than $4 million was spent in the City of Boston, and nearly $20 million in the Commonwealth of Massachusetts.

EXHIBIT 3

Employee Benefits Expenditures FY 1994

Benefits Expenditures	Home Location					Total
	Boston	Brookline	Remainder of Boston Metro Area	Remainder of Massachusetts	Other/No Immed. Impact	
FICA[a]					$19,651,210	$19,651,210
Life Insurance[a]					852,314	852,314
Pensions[a]					16,267,687	16,267,687
Workers' Compensation[b]	$564,112	$282,056	$1,637,567	$117,751	$136,920	2,738,407
Unemployment Compensation[b]	253,144	126,572	734,854	52,841	61,443	1,228,854
Health Insurance[b]	3,502,602	1,751,301	10,167,747	731,126	850,146	17,002,921
Tuition Remission					8,995,688	8,995,688
Other/Recoveries					(5,570,713)	(5,570,713)
Direct Expense Subtotals	$4,319,858	$2,159,929	$12,540,168	$901,718	$41,244,695	$61,166,368
Adjustments[c]					(8,995,688)	(8,995,688)
Direct Expense Totals	$4,319,858	$2,159,929	$12,540,168	$901,718	$32,249,007	$52,170,680

Total Impact on Boston Metro = $33,388,924	Total Boston Metro Area = $19,019,955
Total Impact on Massachusetts = $42,055,046	Total Massachusetts = $19,921,673

NOTE: Numbers may not equal total due to rounding.

(a) Funds paid to the federal government (FICA), the University pension program, and life insurance are saved/invested and do not impact the economy.

(b) Health insurance, workers' compensation, and unemployment compensation, totaling nearly $21 million were distributed based on employee home location.

(c) This adjustment reflects the fact that tuition remission is a deferred expenditure, and therefore does not directly impact the economy.

While tuition remission is a valuable benefit for employees and their families, it is not a direct expense for the University. Benefits such as retirement, social security, and life insurance, are saved or invested and have no immediate financial impact on the three geographic areas examined in this study. Therefore, in EXHIBIT 3 these costs are included with expenditures made outside the Commonwealth. However, if one assumes that many University employees choose to remain in Massachusetts after retirement, the *long-term* impact on Boston, the Metropolitan area and the Commonwealth is actually much greater.

Purchased Goods and Services

In fiscal year 1994, Boston University spent more than $238.5 million on a wide variety of goods and services, ranging from paper clips to trucks to sophisticated computer equipment. This direct spending translates into a total impact of $323 million when the economic multipliers for each industry are applied to purchasing from Massachusetts vendors.

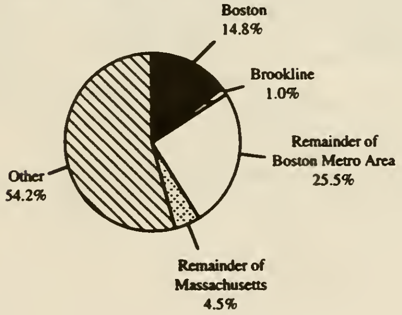
EXHIBIT 4

Purchases of Goods and Services FY 1994

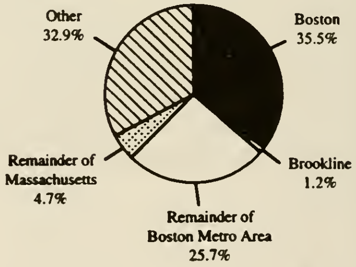
Purchases of Goods & Services	Business Location					Total
	Boston	Brookline	Remainder of Boston Metro Area	Remainder of Massachusetts	Other	
Number of Vendors	4,730	321	8,134	1,438	17,288	31,911
Direct Expenditures	$84,717,150	$2,741,686	$61,292,851	$11,234,109	$78,594,872	$238,580,668
Total Impact on Boston Metro Area = $284,670,960	Total Boston Metro Area = $148,751,687					
Total Impact on Massachusetts =$323,098,439	Total Massachusetts = $159,985,796					

Boston University makes a determined effort to patronize local vendors. Of the nearly 32,000 vendors used, 45.8 percent were located in Massachusetts. These vendors received 67.1 percent of direct University expenditures.

VENDORS BY LOCATION



EXPENDITURES BY LOCATION



Student Living Expenses

Boston University enrolled 29,472 full- and part-time students in fiscal year 1994 (77.4 percent full-time); more than 59 percent of these students came from out-of-state and 37.2 percent were enrolled in graduate or professional programs. The cost of tuition, fees, and room and board for a typical full-time undergraduate student was $24,130. The University distributed more than $117 million in financial assistance to 48 percent of all enrolled students, including 70.5 percent to undergraduates.

Exhibit 5 shows that a total of 28,218 students studied at Boston University, the remainder enrolled in programs overseas. More than 8,100 students lived in University residences and 20,112 lived off-campus (71.3 percent). Based on conservative average annual expenses for each type of housing, we estimate that Boston University students spent a total of $164 million for basic living expenses, transportation, and incidentals. The Multiplier Effect translates this spending into a total impact of $287.5 million in the metropolitan area.

EXHIBIT 5

Student Living Expenditures FY 1994

Student Expenditures			**Residence Location**								**Total**	
	Boston		**Brookline**		**Remainder of Boston Metro Area**		**Remainder of Massachusetts**		**Other**			
	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time
Number of Dormitory Residents	4,184	17									4.184	17
Number of College Apartment Residents	3,888	17									3.888	17
Number of Off-campus Undergraduate Students	3,225	201	697	38	964	252	130	32	1.108	33	6.124	556
Number of Off-campus Graduate & Non-degree Students	3,443	1.263	1.021	387	2.066	2,886	193	366	937	870	7.660	5.772
Total Number of Students	14,740	1.498	1.718	425	3.030	3,138	323	398	2.045	903	21,856	6.362
Total[a]	16.238		2.143		6.168		721		2.948		28.218	
Academic Year Budgets:[b] Dormitory Residents College Apartment Residents Off-campus Students-Undergrad. Off-campus Students-Graduate Part-time Students	$1,005 $3,795 $7.485 $10.776 $2.685		$7.485 $10.776 $2.685		$7.485 $10.776 $2.685		$7.485 $10.776 $2.685		$7.485 $10.776 $2.685			
Direct Expense Totals	$84,194.343		$17.360.466		$37.904.286		$4.121.448		$20.815.047		$164.395.590	

Total Impact on Boston Metro Area = $287.536.762	**Total Boston Metropolitan Area =** $139.459.095
Total Impact on Massachusetts = $309.875.528	**Total Massachusetts =** $143.580.543

(a) Based on Fall 1993 official mid-semester enrollment statistics. Students studying overseas are excluded.

(b) The standard student budgets for the 1993-94 academic year include living expenses, transportation and other incidentals. For purposes of this study, tuition, fees, room and board, and books have been excluded since they are paid to and expended by the University

Throughout fiscal year 1994, the University employed a total of 14,725 students, providing approximately $25.4 million in wages. To cover all of their living expenses, students brought an additional $139 million into the area from non-University sources such as parental support, external employment, and loans.

Total Student Living Expenditures:	$164.4 million
From University wages/salaries for 14,725 students	25.4 million
From Non-University Sources	$139.0 million

University Capital Expenditures

In recent years, Boston University undertook fewer major construction projects than in previous years. Nevertheless, in fiscal year 1994, it spent $27.6 million on capital projects. Contractors in the Boston Metropolitan Area received 75.8 percent of these funds. Applying the Multiplier Effect to these expenditures brings the total impact of capital spending in the metropolitan area to over $41 million.

EXHIBIT 6

Capital Expenditures FY 1994

Capital Expenditures	**Business Location**					**Total**
	Boston	**Brookline**	**Remainder of Boston Metro Area**	**Remainder of Massachusetts**	**Other**	
Number of Contractors	83	4	175	16	94	372
Direct Expenditures	$7,461,543	$91,375	$13,391,350	$620,596	$6,072,530	$27,637,394
Total Impact on Boston Metro Area = $41,213,647	**Total Boston Metro Area =** $20,944,268					
Total Impact on Massachusetts = $46,188,267	**Total Massachusetts =** $21,564,864					

Summary of Direct Expenditures

Direct expenditures by the University, its students and other University-related groups totaled $778.3 million in fiscal year 1994, with 76.6 percent of these expenditures made in the Boston Metropolitan Area — thus having a significant impact on the economy. By applying economic multipliers to direct expenditures, we are able to determine the total economic impact on each area. The following pages explain the use of these multipliers and they show Boston University's total economic and employment impact in greater detail.

EXHIBIT 7

Summary of Direct Expenditures FY 1994

University-Related Expenditures	Location					Total
	Boston	Brookline	Remainder of Boston Metro Area	Remainder of Massachusetts	Other	
Salaries and Wages to Faculty and Staff	$60,892,973	$30,366,850	$176,825,293	$12,694,754	$14,736,134	$295,516,004
Employee Benefits	4,319,858	2,159,929	12,540,168	901,718	32,249,007	52,170,680
University Purchase of Goods and Services	84,717,150	2,741,686	61,292,851	11,234,109	78,594,872	238,580,668
Student Living Expenditures	84,194,343	17,360,466	37,904,286	4,121,448	20,815,047	164,395,590
University Capital Expenditures	7,461,543	91,375	13,391,350	620,596	6,072,530	27,637,394
Direct Expense Totals	$241,585,867	$52,720,306	$301,953,948	$29,572,625	$152,467,590	$778,300,336

Total Impact on Boston Metro Area = $1.2 billion	**Total Boston Metro Area =** $596,260,121
Total Impact on Massachusetts = $1.3 billion	**Total Massachusetts =** $625,832,746

The Multiplier Effect

According to the U.S. Department of Commerce, the total impact on demand and employment of an institution such as Boston University is much greater than the sum of its direct expenditures. Each dollar may circulate through the economy several times, creating additional demand for goods and services, and generating jobs to supply those goods and services, until it is withdrawn through savings, taxes, and expenditures outside the region. Economists call this circulation the "Multiplier Effect" because the impact of each dollar is "multiplied" as it is spent again locally.

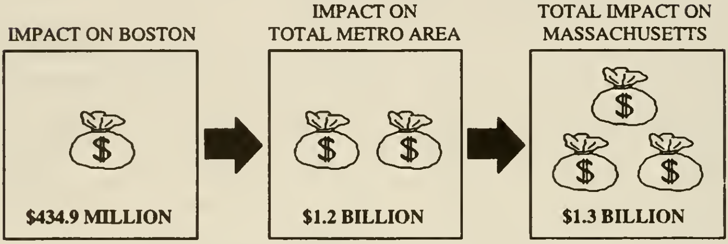
The Regional Input/Output Modeling System (RIMS II) developed by the Bureau of Economic Analysis, U.S. Department of Commerce, calculates output, earnings, and employment multipliers for 39 standard industries within regional and state economies. Each multiplier is determined based on the degree of "economic leakage" that could be realized as dollars circulate through the economy. For this report, output and employment multipliers for the Boston Metropolitan Statistical Area (MSA) and the Commonwealth of Massachusetts were obtained from RIMS II.

Total Economic and Employment Impact

The total financial impact of expenditures by Boston University, its students, and affiliated organizations is an estimated $434.9 million in the City of Boston; $1.2 billion in the Boston Metropolitan Area; and $1.3 billion in Massachusetts. EXHIBIT 8 shows the (weighted) average output multipliers resulting from the volume of expenditures in each of the specified industries: 1.8 for the City of Boston; 2.0 for the metropolitan area; and 2.1 for Massachusetts. The higher average multiplier for Massachusetts reflects the more "closed economy" of a wider geographic area. Expenditures circulate more times within the Commonwealth than they do within the City of Boston.

EXHIBIT 8

Economic Impact of Boston University FY 1994



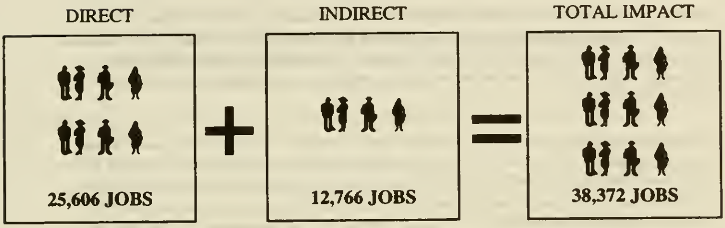
Average Output Multipliers		x Direct Expenditures(a)	= Economic Impact
City of Boston	1.8	$241.6	$434.9 million
Boston Metro Area(b)	2.0	$596.3	$1.2 billion
Massachusetts(c)	2.1	$625.8	$1.3 billion

(a) See Exhibit 7 for Summary of Direct Expenditures.
(b) Includes the City of Boston.
(c) Includes the City of Boston and the Boston Metropolitan Area.

In fiscal year 1994, the University and its affiliates employed 25,606 individuals with a wide variety of educational backgrounds and work experiences. Use of the RIMS II employment multipliers leads to an estimate that 12,766 additional jobs were required to support $1.3 billion of direct and indirect expenditures. Therefore, a total of 38,372 Massachusetts jobs result from Boston University's presence in the region — with 3,648 of these within the City of Boston. As with the output multipliers, average employment multipliers for the state are higher than those for the city.

EXHIBIT 9

Employment Impact of Boston University FY 1994



Average Employment Multipliers (jobs per $1 million of expenditures)		x Direct Expenditures[b]	= Indirect Jobs
City of Boston	15.1	$241.6 million	3.648
Boston Metro Area[c]	17.6	$596.3 million	10,495
Massachusetts[d]	20.4	$625.8 million	12,766

(a) Based on University employment of:

• *Faculty and Staff -*	9.755
• *Students -*	14.725
• *Food and Parking Services -*	413
• *Wholly Owned Subsidiaries -*	713
Total	25.606

(b) See Exhibit 7 for Summary of Direct Expenditures
(c) Includes the City of Boston
(d) Includes the City of Boston and the Boston Metropolitan Area

Generation of Additional Business Activity

Although the figures for the University's direct expenditures do not include local purchases by staff and students, they are, in reality, an important factor in the local economy. Many small businesses are located near the University to serve its population. These businesses, which include restaurants, clothing stores, book stores, copy centers, and pharmacies, provide jobs to local residents and add economic vitality to the area.

In addition, two independent organizations in the metropolitan area are so closely related to the University that, without its presence, they would not exist or would most likely be located elsewhere. These are: Boston University Communication Inc., and the Huntington Theatre Company.

Boston University Communication Inc. (BUCI) is the license holder of WABU-TV 68, a UHF station serving the Boston metropolitan area. In fiscal year 1994, BUCI employed 63 people and had total operating expenditures of more than $2.8 million. These figures are not included in the University figures in this report; however future reports will incorporate BUCI figures with the University figures.

Boston University is a major sponsor of the Huntington Theatre Company, a professional theatre company in residence at Boston University, which had operating expenditures of $5.2 million during fiscal year 1994. Financial information was not available on a geographic basis and was, therefore, excluded from the analysis of direct expenditures; these expenditures, however, did increase the economic impact of the University on the local, regional and state economies. For the 1994 theatre season, the Huntington Theatre Company had ticket sales totalling $2.8 million by 142,000 patrons.

Direct Payments to the City of Boston and the Town of Brookline

Property owned or leased by the University is legally exempt from property taxes. Nevertheless, the University has responded to the City of Boston's financial needs by paying taxes on certain properties acquired prior to 1980, by paying taxes on all properties purchased since 1980, and by making additional payments in lieu of taxes. Since fiscal year 1981 the University and its wholly-owned subsidiaries have paid over $17.5 million in property taxes to the City of Boston.

The University and it affiliates made the following direct payments to Boston and Brookline in fiscal year 1994:

- $361,386 payment to the City of Boston in lieu of taxes
- $2 million in real estate property taxes to Boston
- $502,622 in real estate property taxes to the Town of Brookline
- In excess of $200,000 to Boston for fees and permits, including building and inspection permits and parking and entertainment license renewals
- $23,700 to Brookline for licenses, permits and other town fees.

The above figures are included in total purchases of goods and services as shown in the table on page 14.

Attraction of Additional Financial Resources

The University's reputation as an educational and research institution attracts financial resources from outside the local area. For example:

- In fiscal year 1992, the latest year that national figures are available, Boston University is ranked 43rd among all colleges and universities receiving federal funding. In that year, federal sources contributed approximately $99 million for research and other educational purposes.
- In academic year 1993-94, 59.5 percent of enrolled students were from out-of-state, bringing approximately $256 million in tuition and fees into the area. In addition, 4,547 international students from 136 countries attended Boston University.
- Landlords and businesses in the City of Boston benefited from 8,132 students who lived in the City. An additional 2,143 students lived in the Town of Brookline.
- Massachusetts lending institutions provided approximately $45.3 million in educational loans to University students during academic year 1993-94.
- EXHIBIT 10 illustrates the fact that alumni, friends, corporations and foundations located *outside* Boston donated more than $29.7 million to the University, including $24.7 million from outside Massachusetts.

EXHIBIT 10

Private Voluntary Support FY 1994

Source	Home Location				Total
	Boston	Remainder of Boston Metro Area	Remainder of Massachusetts	Other	
Alumni	$431,884	$1,365,927	$271,138	$5,295,984	$7,364,933
Friends	559,686	1,945,527	201,869	2,284,645	4,991,727
Corporations and Foundations	1,958,878	1,143,001	33,353	13,426,080	16,561,312
Other	246,507	25,910	4,290	3,719,775	3,996,482
Total	$3,196,955	$4,480,365	$510,650	$24,726,484	$32,914,454
		Total Support from Outside the City of Boston =		$29,717,499	

In addition, the University attracts thousands of people to the campus and neighboring communities each year in order to visit students, and to attend academic programs, athletic events, cultural and social events, alumni and class reunions, and Commencement activities. Visitors spend money for consumer goods, lodging, entertainment, food, parking, and gas. Although these purchases are not easily quantifiable, they are considerable, and flow directly into the local economy.

Additions to "Human Capital" - The Alumni

A degree from Boston University is valuable both to the individual obtaining the degree and to the communities where he or she lives and works. The economic value of a degree can be measured by estimating the increased earnings potential of degree holders and the corresponding additional economic activity they generate.

EXHIBIT 11 illustrates the fact that 33.5 percent of all Boston University alumni live in the Boston Metropolitan Area, and that 39 percent of all alumni live in Massachusetts. These alumni form part of a well-educated and highly skilled labor force.

EXHIBIT 11

Boston University Alumni FY 1994

Alumni	**Home Location**				**Total**
	Boston	**Remainder of Boston Metro Area**	**Remainder of Massachusetts**	**Other**	
Number of Alumni	9,685	54,720	10,832	116,952	192,189

Total Boston Metro Area = 64,405

Total Massachusetts = 75,237

The University attracts many out-of-state students to the Boston area. In the fall of 1993, almost 79 percent of entering freshmen were from outside Massachusetts. An analysis of freshman who first enrolled in September of 1984, 1986, and 1988 supports the long-held belief that many University students choose to remain in the Boston area after graduation. On average, 16.1 percent of the incoming out-of-state freshmen of the mid-1980's still reside in Massachusetts; with 7.5 percent still living in the City of Boston.

Data regarding University alumni income were not available. However, it is reasonable to expect that the increased earnings potential of University graduates, combined with the large percentage of alumni who reside permanently in local communities, increases the level of economic activity in the Boston Metropolitan Area.

Municipal Services

Boston University makes a significant contribution to the City of Boston by performing many municipal services which the City would otherwise have to fund itself. Examples include the following:

- The University employs its own police force, consisting of 53 police officers and 25 security guards who provide protection 24 hours a day, 7 days a week. The force serves as a deterrent to crime in neighborhoods close to the Charles River campus and also patrols the Medical Campus in the South End, reducing crime in that area.

- University Police provide backup assistance to the Boston, Brookline, Cambridge, and State Police when needed.

- Through a Ride-Along Program, the Director of Community Relations rides with Boston Police when responding to off-campus party and/or noise complaint calls on weekends. The Director has authority to discipline students when necessary.

- While patrolling the campus area the University Police issue parking tickets for the City of Boston. In fiscal year 1994 over 1,275 parking tickets, with an aggregate value of more than $41,780, were issued for the City.

- The University provides daily maintenance of sidewalks, MBTA tracks, and streets around the campus. At a cost of over $800,000 in 1994, the University repaired and cleaned sidewalks and streets, removed snow, and planted shrubbery.

- The University pays for City police and fire details during high attendance events. In fiscal year 1994, these payments totaled $14,483.

- The University controls and manages its own rubbish removal, using private contractors. In fiscal year 1994, the University paid over $663,000 for these services at the Charles River Campus.

Boston University makes every effort to reduce its impact on traffic flow and available parking. Students are encouraged to live on campus or within walking distance. Through an on-campus MBTA Pass Program, University faculty, staff, and students are encouraged to use public transportation. A carpool program matches employees and students who live in the same community, and a shuttle bus is available for students who live off campus in the surrounding neighborhoods.

Summary

This section report was prepared to describe the economic benefits that Boston University provides to the City of Boston, the Boston Metropolitan Area, and the Commonwealth of Massachusetts. In addition, numerous community, educational, cultural, humanitarian, recreational and municipal services are either funded directly by the University or indirectly through foundation contributions, research grants, etc. Programs and services which impact the economy and quality of life in the Boston Metropolitan area include: neighborhood health centers, the Boston University/Chelsea Partnership, Boston and Brookline scholarships, academic enrichment and remedial help programs, a University-owned and sponsored radio station, free (or discounted) concerts and lectures, and recreational facilities made available for local high school competitions. A comprehensive list of these services follows in Section 3.

3· The Social Impact

In addition to the positive economic impact of Boston University described in the previous section, numerous community, educational, cultural, humanitarian, recreational and municipal services are either funded directly by the University or indirectly through foundation contributions, research grants, etc. Programs and services which impact the economy and quality of life in the Boston Metropolitan area may be part of an structured, academic curriculum; may be programs that support the teaching and training of the University through hands-on experience for the students in their areas of concentration; or may be programs that the faculty, staff, and students of Boston University choose to volunteer their time and energies; many of these volunteer opportunities within the community are coordinated by the Community Service Center, a student directed organization. A comprehensive listing of these social programs follows.

Educational Programs and Services

Boston University/Chelsea Partnership The University has entered into an unprecedented ten-year agreement to manage the Chelsea public school system. Chelsea schools and the children who attend them suffer from such problems such as a high dropout rate, low SAT scores, and a high teenage pregnancy rate. The University's comprehensive approach to the project involves students, faculty, and staff from many schools within the University, who provide educational, medical and management services. The University is committed to working with the Chelsea community to restructure and rebuild its school system. Since the program's inception, the annual high school dropout rate has decreased 10 points. *Information: 889-8411.*

Scholarship Assistance The University annually provides hundreds of scholarships to residents of the greater Boston community. In 1993-94, over 350 scholarships worth more than $5.2 million were awarded to Boston public high school graduates, Boston city employees, Boston public school teachers, Boston parochial school graduates, graduates of Bunker Hill and Roxbury Community Colleges, and families of fire fighters killed in the line of duty. The cumulative value of such scholarships since 1981 has been over $33 million. In addition, the University provides scholarships to residents of Chelsea and Brookline. *Information: 353-2335.*

School of Education Consortium Council The School of Education directs a consortium of seven local public school systems and eleven public agencies. Education students complete field work in a variety of settings offered by consortium members; the members advise on matters of curriculum reform and performance evaluations. In addition, Boston University has made money available to fund some of the educational programs of the consortium members. Recent programs include an after-school enrichment program, an artist-in-residence series, and exchange programs between inner-city and suburban schools. *Information: 353-3223.*

The Boston University Science and Mathematics Education Center In 1990, responding to the need for innovation in science and mathematics education, faculty at Boston University established the Boston University Science and Mathematics Education Center. This Center provides incentives for scientists and mathematicians to share their expertise with middle and high school teachers and their students. Faculty who initiate curriculum and educational projects in these areas receive support and encouragement from the Center, and local teachers, in turn, share their insights with University faculty. *Information: 353-7100.*

The Boston University Center for the Advancement of Ethics and Character promotes the development of research, publications, and outreach programs that help school teachers become more competent and confident in the teaching and study of ethics and character. Faculty in the Center help schools take a legitimate and effective role in the development of ethical understanding in students. *Information: 353-3262.*

The National Center for America's Founding Documents develops curricula and initiates activities that promote the study of America's Founding Documents. The most important educational mission of our nation is to encourage responsible citizenship in each generation. Students must learn the rights and responsibilities of citizenship and achieve a competent understanding of America's founding principles. The most effectife means of accomplishing this mission is through the study of America's founding documents. *Information: 353-6278.*

Field Placements of Student Teachers All students pursuing certification programs in the School of Education must complete a field placement in an appropriate school or community agency. The School has been linked with neighboring public schools since 1910, and has placed thousands of Boston University students in classrooms. In 1993-94, more than 800 students assisted teachers and social service agencies in the Boston area and throughout the world. *Information: 353-3223.*

The Early Learning Center is a public pre-school developed in 1987 by faculty in the Urban Initiative from Boston University and Wheelock and Simmons Colleges and by Boston school personnel. Serving children between the ages of three and six, the school is open year-round from 8 a.m. to 6 p.m., offering both instruction and day care. It has become a national model for early education programs. *Information: 353-3551.*

The Educational Clinic, housed in the School of Education, has offered diagnostic assessment and remedial tutoring in reading to hundreds of students from Boston area elementary schools since 1932. Assessment and tutoring is offered by graduate students in the School under the direction of the clinic director. *Information: 353-3223.*

The Reading and Study Skills Clinic The clinic offers individual reading evaluation and remedial hlep to middle and high school students and adults. Tutoring is offered at the School of Education by graduate students in the reading program. The clinic has served as a model for other such programs and has introduced hundreds of children and adults to a richer reading experience. *Information: 353-3223.*

The Microcosmos Project has developed a curriculum guide with hands-on explorations that show that the world of microorganisms can by a dynamic learning vehicle for students. The

NSF-supported program features a unique science education museum created by teachers and focuses on conducting special courses/workshops for science teachers. Since 1988, more than 2,100 teachers from around the country have attended intensive sessions at the University, while some 4,000 have received special training at various regions around the nation. *Information: 353-2754.*

Sargent Camp, a year-round recreational facility in New Hampshire, serves a wide constituency under a guiding ethic that aims to foster stewardship for the environment and a sense of teamwork. Each year, more than 3,000 school children participate in environmental education programs. In addition, numerous corporations, colleges and universities participate in adventure-based team-building programs. The camp is also a meals site for the Senior Nutrition Program three days a week. *Information: 603/525-3311.*

African Studies Center. The African Studies Center's Outreach Program disseminates information on Africa and African-related issues to the public and professionals, such as elementary and secondary school teachers, journalists, and museum specialists. *Information: 353-3673.*

The Science Teacher Renewal Program has invited public school science teachers to come to Boston University for either a semester or a year of study with School of Education faculty and graduate students. Since 1985, a number of teachers have taken advantage of this opportunity. *Information: 353-4259.*

Prison Education Program. This program provides credit courses and degrees to inmates at Massachusetts Department of Corrections prison facilities. The University subsidizes tuition and faculty salaries. Since 1977, more than 100 bachelors' and 20 master's degrees have been granted. The recidivism rate for graduates of this program is extremely low. *Information: 353-5945.*

Project STEP The String Training and Educational Program for minority students offers musical training to gifted Boston-area students. The program is a collaboration between the School of Music, The Boston Symphony Orchestra, and the Greater Boston Youth Symphony Orchestra. *Information: 353-3348.*

Summer Training and Education Program for Burke High School inner-city school students offers both remedial academic help and employment to approximately 50 students each summer. For seven weeks, students receive tutoring each day and hold down clerical or other jobs at the University. *Information: 353-9852.*

The High School Honors Science and Engineering Program was started in 1978 to offer twenty to thirty highly talented high school juniors from throughout the country the opportunity to come to the University for six weeks in the summer in order to conduct serious scientific and engineering research. The program is funded by a National Science Foundation grant administered by Boston University. *Information: 353-5124.*

The Jackson Mann Community School Adult Education Program is run by Champions, a community service group in the College of Communication. Student volunteers work at the school tutoring, adult immigrants who are illiterate in English. *Information: 353-3450.*

The Intergenerational Literacy Project in Chelsea encourages language and literacy development in families who speak languages other than English. Both children and parents attend classes that place emphasis on valuing their cultural heritage while teaching them reading, writing, and speaking skills in English. The program, which is part of the Boston University/Chelsea Partnership, began in 1989. *Information: 353-3285.*

After-School Program Volunteers contributed 8,600 hours of service in 1993-94 to after-school programs throughout Boston. Volunteers assist with youth tutoring and recreational programs for students ages six to fourteen. *Information: 353-4710.*

The Literacy Program, one of the many volunteer programs run by the Community Service Center, works with several literacy agencies in the greater Boston area. Boston University students serve as tutors in English as a second language, adult basic education, and help individuals seeking a General Equivalency Diploma. *Information: 353-4710.*

Program in Mathematics for Young Scientists (PROMYS) is a six-week summer program for high school students from all over the United States. Students chosen on the basis of merit and potential attend classes emphasizing active problem solving, including the formulation, criticism, and modification of conjectures. *Information: 353-2563.*

College Preparation Workshops, offered by the Boston University Office of Undergraduate Admissions, help Brighton High School students evaluate colleges and submit applications. Workshops have been held since 1983. The University's Director of Financial Assistance runs an additional workshop for parents applying for financial aid. *Information: 353-2318.*

Upward Bound/Project Advance This program provides academic enrichment and remedial help, on an annual basis, to approximately 100 Boston-area high school students through intensive classroom work during the academic year and a six-week residential tutorial program in the summer. *Information: 353-3551.*

The Advanced Studies Program offers scholarships to up to twenty seniors from Brighton High School and English High School for one course at Boston University. Students who exhibit the potential to benefit from a college-level course are thus able to build their skills and gain credit toward a college degree. More than 135 students have received scholarships since 1984. *Information: 353-3551.*

Boston Higher Education Partnership Formed in 1975, the Partnership contributes expertise and resources to the Boston public schools. Programs have been developed over the years to support and educate children, train teachers and administrators, and provide scholarship funds to make college a reality for thousands of Boston students. Boston University plays a leading role in this cooperative organization of 25 colleges and universities. In 1993-94, Boston University provided approximately 31 percent of all funding contributed by the Partnership, including more than $4.9 million in scholarships, over $1 million in *pro bono* services, and more than $1 million in external grants. *Information: 353-2252.*

Boston University/Boston Schools Collaborative This Collaborative program provides a variety of services and access to University resources for selected Boston public schools. Services include technical assistance and professional development activities for teachers and school administrators. *Information: 353-3551.*

The Urban Initiative In 1985, the Boston University School of Education, in collaboration with faculty of Wheelock College and Simmons College, founded The Urban Initiative to address the problems of urban schools. Projects of The Urban Initiative, which is directed by a Boston University professor, have included the design and development of a child care program which centers on education for children aged 3-6. *Information: 353-3212.*

The Schools Reaching Out project seeks to foster academic and social success for children through the promotion of improved parent/school/community relationships. The project primarily targets low-income communities. Initial efforts in the David A. Ellis School in Boston have included the development of an on-site Parent's Center staffed by those involved in parent outreach. *Information: 353-3551.*

Boston Leadership Academy offers seminars for school teams comprised of teachers and administrators leading to the development of skills in leadership, goal-setting, program planning, evaluation, and analysis of educational outcomes. Since 1989, the Academy has provided training to those involved with the Boston Public Schools as part of a School-Based Management/Shared Decision Making program system-wide; training programs have reached more than 600 parents, teachers, and administrators from 117 schools of the Boston Public Schools System. *Information: 353-2252.*

Partners in Learning is a mentoring program pairing children from the Lewis Middle School in Roxbury with Boston University students who serve as role models. This program was honored by President George Bush as a Point of Light in 1991. The program is designed to work with at-risk youths to assist them in developing life strategies. Since 1988, the program has served 120 students. *Information: 353-2252.*

Business/Professional Programs and Services

PR Planners, a student public relations agency in the College of Communication, has been offering free public relations assistance to non-profit organizations for over a decade. An average of thirty students each year spend six to ten hours a week for one semester working on-site, devising publicity campaigns, developing public relations programs, arranging fund-raising events, and establishing media contacts. *Informaton: 353-3497.*

AdLab is a professional advertising laboratory run by the College of Communication. Students in the school have developed and implemented advertising campaigns for more than 200 public service and non-profit agencies since 1975. Clients hire AdLab as they would hire any professional agency, and must have a budget capable of implementing the plan. However, they are charged only for out-of-pocket costs. *Information: 353-3476.*

Film Unit is a student-run film production group of the College of Communication. Working as a team, students solicit and produce sponsored films and commercials for local and national clients and, under faculty supervision, perform all executive, creative, and technical roles. *Information: 353-8933.*

Boston University Television (BUTV) is a student-run entity of the College of Communication that develops and produces television programs for closed-circuit and, possibly, cable-access distribution. BUTV also produces low-budget videos for non-profit organizations. *Information: 353-4545.*

The **Public Management Internship Program** is an opportunity for Public Management students to apply classroom learning to real-world problems, and to experience a managerial project in a public or not-for-profit organization. Examples of internship sites are: Cambridge Civic Association, La Alianza Hispaña, Environmental Futures, the City of Newton, and the National Trust for Historic Preservation. *Information: 353-2312.*

The **Center for Energy and Environmental Studies** offers publications designed to deliver information to the community regarding the interrelationships between energy and the environment, emphasizing the significance of scientific research in policy-making. *Information: 353-3083.*

The **Manufacturing Roundtable** teams faculty investigators with operating executives from a variety of industries, conducts conferences, seminars and symposia, and develops new courses, curricula, and teaching materials to advance manufacturing excellence through applied research. *Information: 353-5077.*

The Legal Aid Program enables law students to assist indigent clients in Boston. through the Greater Boston Legal Services Students are assigned cases concerning housing, welfare and social security benefits, unemployment compensation, consumer protection, divorce, special education, and other matters. *Information: 357-5757.*

Criminal Law Clinics, open to third-year law students, have served the Boston area for more than twenty-five years. Students are responsible for the defense in nearly 350 criminal cases each year in the Boston Municipal Court and the Cambridge District Court, representing indigents who would otherwise require a court-appointed attorney. Students in the Prosecution Program represent the Norfolk County District Attorney's Office in cases in the Quincy District Court, prosecuting more than 180 cases annually. All cases are closely supervised by faculty members, who are practicing attorneys. *Information: 353-3131.*

The Legislative Services Program involves law students in the drafting of legislation and other projects for legislators, public interest groups, and government entities. Students assist in the formulation and execution of legislative solutions to problems. Approximately forty students have been involved in this program since 1975. *Information: 353-3115.*

Jewish Vocational Services (JVS) offers a training program for unemployed and underemployed individuals who reside in the City of Boston. Boston University employment specialists are fostering with this agancy by offering presentations and workshops on interviewing skills and employment opportunities at Boston University. *Information: 423-8662.*

Center on Work and Family, co-sponsored since 1990 by the School of Social Work and the School of Management, was established in 1990 as the first university-based research organization devoted to the study of work and home life issues. Through research, demonstration projects, corporate partnerships, and policy forums, the Center brings an informed knowledge base to corporate and public policymakers responsible for shaping healthy and productive workplaces, families, and communities. *Information: 353-7225.*

Students from the Sargent College of Allied Health Professions have been serving the community since 1933. In any given year, seventy-five students work as physical therapists, speech pathologists, nutritionists, or occupational therapists. These unpaid professionals provide their services for forty hours a week, and from three to six months in area hospitals, rehabilitation and veterans associations, public schools, and other treatment centers. *Information: 353-2708.*

The Imani Ministry is a cooperative program between members of Marsh Chapel and local African-American clergy. This cooperative group offers worship on campus in the African-American tradition, bringing in local pastors with their congregations and choirs. *Information: 353-3560.*

Student Interns from the School of Social Work have been serving the community since the 1920s. Every year, more than 500 students work two or three days a week in non-profit social service agencies in the fields of health, mental health, child welfare, and services for the elderly or refugees throughout New England. Students offer direct clinical services or work in community organization, systems management, or program planning. *Information: 353-3754.*

Student Interns from the School of Theology have been serving as Assistant Ministers, Christian Education Directors, and Youth Ministers in local parishes for decades. Between twenty-five and thirty students serve in these parishes for fifteen to twenty hours a week during their second year at the School. *Information: 353-3050.*

Community and Government Programs

The Office of Government and Community Affairs, the primary University administrative group linking the University with the community recognizes that Boston University has an impact on its neighbors, and works to ensure that this impact is positive. The Office maintains frequent contact with area residents and state and local leaders, keeping them informed about development plans, evolving programs, cultural events, lectures, workshops, and seminars offered to the community. Two full-time professional staff members work directly with state and city government officials. The Director of State Relations represents the University's interests before the Legislature, Board of Regents, and executive branches of state government. The Director of City Relations maintains contact with the Mayor's office, the City Council, and city agencies. *Information: 353-9095.*

Community Affairs A Director of Community Relations and a Community Relations Liaison maintain personal contact and communication between the University and its neighbors, working closely with residents and officials in Boston and Brookline. They respond to inquiries, organize efforts to meet community needs, and work closely with local business associations. *Information: 353-9095.*

The Ride-Along Program Responding to neighborhood concerns about student parties, the Director of Community Relations "rides along" with the Boston Police on designated weekends. Students are encouraged to register events with the University, are given guidelines for the conduct of parties and, if necessary, are disciplined for unacceptable behavior. *Information: 353-9095.*

Community Task Force Since 1984, the University and local representatives have used the Boston University Community Task Force as a forum to discuss community issues. University administrators, planners, and consultants also meet regularly with representatives of neighboring community organizations. *Information: 353-9095.*

Master Plan Boston University, in cooperation with Community Task Force representatives and city agencies, was the first institution in the area to develop a Master Plan approved by the Boston Redevelopment Authority. The 10-year plan for the Charles River Campus analyzes both the University's needs (housing, enrollment, parking, academic and recreation) and potential sites for development. *Information: 353-9095.*

Project Advisory Committee As an extension of the master planning process, the City and University organized a Project Advisory Committee to review a Planned Development Area Master Plan for the Commonwealth Armory site. Representatives from neighboring communities serve on this committee. *Information: 353-9095.*

Interinstitutional Transportation Management Association (ITMA) representing Boston City Hospital and Boston University Medical Center is a cooperative effort to coordinate the transportation needs of the thousands of people who daily receive care from, are employed by, or study at the sponsoring institutions. The ITMA is a proactive organization committed to working collaboratively with the community and local, state and federal agencies to propose and implement better transportation options for its neighbors, employees, staff, students, patients, and visitors. *Information: 638-7430.*

Programs and Services for People with Disabilities

Pike Prize for Service to People with Disabilities is awarded annually by the N. Neal Pike Institute on Law and Disability, a part of the School of Law, to a person who, despite a physical or mental impairment, has achieved notable success, or to an able-bodies person or organization that has greatly helped individuals with disabilities. *Information: 353-2904.*

Disability Law — News and Commentary is a 15 minute, bi-weekly radio program carried by the Massachusetts Radio Reading Network of the Talking Information Center located in Marshfield. *Information: 353-2904.*

Human Rights Conferences Each year, the Pike Institute co-sponsors two conferences with the Human Rights Advocacy Committee of the Massachusetts Department of Mental Health. More than 700 mental health workers and advocates attended the 1993-94 sessions. *Information: 353-2904.*

Pike Health Law Discussion Series Five or six times during the academic year, a visiting expert presents a talk on some health-related topic. Issues discussed include: litigation involving newborn infants with brain damage, adoption and disabilities, students with disabilities and standardized testing, life-sustaining treatment for people with disabilities, and representing clients with mental retardation. The public is invited. *Information: 353-2904.*

Disabilities is a volunteer program run by the Community Service Center. Volunteers worked with people who are visually or hearing impaired, or who had a physical or mental disability. Placements include the Perkins School for the Blind, the University's Office of Disability Services, Franciscan Children's Hospital, and Toward Independent Living and Learning. *Information: 353-4710.*

Student Interns from the School of Education's Department of Special Education have been working in local schools and agencies for decades. Each year, more than 30 students work with children and adults who have physical or psychological disabilities. *Information: 353-3212.*

Medicaid Working Group is a partnership to develop new reimbursement and clinical care programs for people with servere disabilities or chronic illness; it is funded by grants from the Robert Wood Johnson Foundation and the Pew Charitable Trusts. The Medicaid Working Group will work with selected Medicaid programs, HCFA, and experienced health care providers throughout the state to implement these new models of care. *Information: 638-5042.*

Professional Participation Two Pike Institute attorneys presented nine community talks during the 1993-94 academic year on disability issues, and these attorneys and the Institute's administrative assistant, served on a total of 13 boards, committees, and task forces during the year. *Information: 353-2904.*

A Special Needs Dental Program, run by the Dental School, sends doctors and students to more than 600 sites throughout Massachusetts to provide basic dental care to children and adults with disabilities. More than 5,800 patients are seen yearly in early intervention programs, Chapter 766 school programs, adult day programs and workshops, and community residential programs. *Information: 638-4891.*

Boston Marathon Medical Care Volunteer physicians and staff from the School of Medicine provide medical care as needed for wheelchair athletes in the Boston Marathon. In addition to the actual care, staff also participate in the Marathon planning. *Information: 638-7307.*

Programs and Services for Elders

Evergreen Program Boston University sponsors this year-round program that, for a nominal fee of $10-$25, provides senior citizens with courses and lecture s covering such subjects as politics, foreign languages, literature and music, and physical activities . A new series of lectures is offered throughout the year. Between 150 to 300 elders from the Greater Boston area attend each series. In addition, through the Evergreen program senior citizens are permitted to audit all regular University courses, whenever space is available, for a fee of $20. *Information: 353-9852.*

The Gerontology Center conducts research and promotes education on aging. Courses are offered to practitioners and other interested persons on such subjects as: caregiver stress, healthy aging, drug interactions, and national health insurance. Some academic courses are available under the Evergreen Program. *Information: 353-5045.*

Through the Ages Volunteers work with elderly people on a one-to-one basis, helping at a senior drop-in center, or working on special events for the elderly (e.g., holiday parties). Volunteers also provide the elderly with needed companionship. *Information: 353-4710.*

The Home Medical Service, sponsored jointly by the School of Medicine and the Boston University Medical Center Hospital, is the oldest continuously operating home medical program in the United States. Home Medical provides an array of health services for Boston elderly, delivering medical care to patients in their own homes. The Service makes approximately 5,000 home visits to 800 elders each year, thus enabling many patients who would otherwise require placement in nursing homes to remain independent. No patient is ever denied service for lack of ability to pay. *Information: 638-6100.*

Geriatric Assessment Center is a consultation program which provides comprehensive interdisciplinary team assessments of individuals 65 years of age or older. The center. begun in 1986, is dedicated to identifying problems which reduce the independence of older people and to making practical recommendations to enable individuals to function to their fullest capacity. *Information: 638-6138.*

Elders Living At Home Program serves low to moderate income elders, age 60 or older, who are homeless or face the loss of their apartments, or who live in a life-threatening situation. The program provides clients with temporary shelter leased from the Boston Housing Authority while permanent housing is located. ELAHP also provides or arranges for social services, health services, and legal counsel. This program also coordinates nursing and social work staffing and the Cardinal Medeiros Center, a nutrition site that serves some 150 homeless people daily. *Information: 638-6139.*

Vaccines and Screenings Through the Boston University Medical Center, free vaccinations and health screenings are provided to the community. These include annual influenza vaccinations and screenings for skin cancer as well as for prostate cancer, glaucoma, and osteoporosis. In Fall 1993, some 2,200 elders received free flu shots in over 30 locations in the City of Boston. *Information: 638-6140.*

Massachusetts Elderly Diabetes Education Program (MEDEP) The School of Public Health, in conjunction with the Massachusetts Department of Public Health, the Office of Elder Affairs, the Boston Commission on Affairs of the Elderly, and The Joslin Diabetes Center, conducts a series of health education and training initiatives to increase diabetes-related symptom recognition, help-seeking, and follow-up care among elders. The program targets 750 low-income elders with information, screening programs, and follow-up medical care for complications. *Information: 638-4640.*

Geriatric Dental Health Programs are provided to more than 900 elders annually by doctors from the Goldman School through the Home Medical Service and through visitations to four nursing homes, the Spaulding Rehabilitation Hospital and the Jewish Memorial Hospital. *Information: 638-5079.*

Elder Services Outreach is a program begun in 1994 to coordinate elder heath and housing services. The program benefits from a Robert Wood Johnson Foundation Award in Community Health Leadership. This program involves the recruitment, training, and supervison of medical, nursing, and other health professional students in a number of health and social service outreach to 'at risk' elders in the City of Boston. *Information: 638-6140.*

Sargent Camp, a year-round recreational facility in New Hampshire, is a meals site for the Senior Nutrition Program three days a week. *Information: 603/525-3311.*

Health Care and Related Programs and Services

The Boston University Medical Center in the South End of Boston includes the School of Medicine, School of Public Health, the Goldman School of Graduate Dentistry, and Boston University Medical Center Hospital. The BUMC Hospital and Boston City Hospital, located directly adjacent to the Medical Center complex, are the principal teaching affiliates of Boston University School of Medicine. This rich concentration of medical educators, researchers, and health care professionals represents a major resource for many Boston communities that receive direct services. They are major deliverers of primary care for residents of the South End, South Boston, Roxbury, and Dorchester. The Boston University Medical Center Hospital provides free care to patients unable to pay. Many projects run by the Medical Center are described below, but there are dozens of other contributions to health care delivery, preventive medicine, and education carried out by individuals at the Center. The Sargent College of Allied Health Professions on the Charles River Campus also offers a wide variety of health care services to the community.

Health Care Affiliates There are twenty-two New England hospital and health-care agencies affiliated with the Boston University School of Medicine. Boston University Medical Center Hospital, Boston City Hospital and the Boston Veterans' Administration Medical Center are the School's principal affiliates in addition to many community hospitals. Students and faculty from the School of Medicine treat thousands of patients in these facilities annually.

Boston City Hospital's clinical staff is comprised almost exclusively of School of Medicine faculty members and physicians in training. This hospital is the only source of medical care for many of Boston's residents, particularly those from inner-city neighborhoods.

Boston Emergency Medical Center, comprised of Boston University Medical Center Hospital and Boston City Hospital is the busiest of Boston's three Level One trauma centers. The School of Medicine plays a key role in training emergency medical personnel in the treatment of trauma victims.

The Solomon Carter Fuller Mental Health Center, a state facility located at the Medical Center complex, is a mental health center offering screening, inpatient and outpatient care, the Children's Special Unit, the Roxbury Court Clinic, and a medication Drug Clinic. Medical Center staff provide technical assistance to the Center. *Information: 266-8800.*

Primary Care Medical Education is now in the third year of a Kellog Foundation grant that has enabled the growth and development of ties with a network of neighborhood health centers. Recently, announcement was made of a six-year award from the Robert Wood Johnson Foundation to enhance primary care education in anticipation of greater numbers of students selecting primary care as a career. Boston University's experience managing matriculation agreements with a network of traditionally black colleges and universities combined with the several pathways to medical school at the University itself provide an unusual laboratory to experiment with interventions that may direct students into careers as generalist physicians. *Information: 638-4147.*

The Fetal Alcohol Education Program at the School of Medicine has been training health care providers since 1974 in the early identification of families at risk for fetal alcohol syndrome. Professionals from the program give more than forty lectures and workshops annually to health centers and hospitals, in addition to offering information by telephone. The Program received more than 300 calls in a recent ten-month period during which it served individuals and agencies in the United States and several foreign countries. *Information: 739-1424.*

The Boston Area Health Education Center under the auspices of the Medical Center, has been working in urban neighborhoods for a decade. The Center develops educational programs that help to support the primary care practitioners who are already there and encourage medical and nursing students to go into primary care practice in the inner city. The Center arranges for medical students to provide services to the twenty-five **Neighborhood Health Centers** throughout the city, which provide high quality primary health care in neighborhoods where it would not otherwise be available. *Information: 638-5110.*

The **Cancer Research Center** sponsors educational programs and its staff carries out patient-care activities at the Boston University Medical Center Hospital, Boston City Hospital, Boston V.A. Medical Center, and other hospitals affiliated with the School of Medicine. *Information: 638-4173.*

Cancer HelpLink is a free cancer information service provided by the Boston University Medical Center Hospital. Callers speak with an oncology nurse to receive information about cancer incidence, prevention, treatment options, and the latest clinical trials. Nurses can also help callers identify appropriate questions to ask their physicians in order to help them be more informed about the care they are receiving. Social services information is also provided, and health literature is sent to those callers who wish to receive it. *Information: 1-800-524-8541.*

Biotechnology Education Several educational training programs are offered to the community including a Teacher Training Program, a minority High School Student Research Apprentice Program, a Biomedical Careers Program, and CityLab. Since 1990, 100 high school science teachers have participated in biotechnology training, 40 students and 9 teachers have assisted in the High School Research Apprentice Program, and 50 Boston residents have completed the 28-week training program in Biomedical Careers. Another 3,000 students and 300 teachers have participated in the CityLab program. *Information: 541-5622.*

Health Connections is a free health information and referral service provided by the Boston University Medical Center Hospital. Staffed by registered nurses, callers have access to a medical professional who can triage the call by determining the caller's needs, answering medical questions, and assessing the immediacy of care or services needed. Additionally, nurses have access to a broad array of support services listings. Nurses are especially helpful to those callers who are uninsured and are having difficulty accessing appropriate health services. Health literature is sent to those who request it. *Information: 638-6751.*

HIV-AIDS and Substance Abuse Education The School of Public Health provides a HIV-AIDS and substance abuse education to community health workers who need education about HIV and sexually transmitted diseases. The project has provided scholarship assistance for the certificate program and daycare for some participants. *Information: 638-5160.*

Young Gay Men's Study is designed to estimate the prevalence of HIV and Hepatitis B and the behaviorial factors associated with this at risk group. The program also provides education, counseling, and testing to reduce the risk factors. The program is in conjuction with the *Fenway Community Health Center. Information: 534-4749.*

AmeriCorps Health and Housing Fellowships places returned Peace Corps volunteers in 15 Massachusetts housing authorities to improve the health status of tenants and the surrounding community, and to help families enrolled in the Department of Housing and Urban Development's Family Self-Sufficiency Program to reduce their dependence on public assistance. *Information: 638-4640.*

The Mom's Project is a community-based substance abuse eradication program designed to help drug- or alcohol-addicted women of the inner-city end their dependence. *Information: 638-4640.*

The Failure to Thrive Clinic at Boston City Hospital has been at work since 1984 to identify and treat children who are not growing at a normal rate due to malnutrition. Most of these problems are due to poverty and resulting family stress. *Information: 638-5160.*

The Massachusetts Chapter of the Committee to Combat Huntington's Disease has its headquarters at the Medical Center. Medical Center faculty and staff regularly raise funds for the Chapter. Each year, the Medical Center sponsors a Hoop-a-thon to raise money for a summer camp for Huntington's patients. *Information: 638-8333.*

The Parkinson's Disease Program, with headquarters at the Medical Center since 1979, runs an information and referral center that responds to over 3,000 telephone inquiries every year. *Information: 638-8456.*

The Resource and Referral Center for Alzheimer's Diseases and Related Disorders, located at the Medical Center, provides information about the disease and and how to obtain help and treatment. The Center answers more than 1,200 requests for information annually. Physicians at the Center are engaged in research on new medications to treat Alzheimer's and related diseases. *Information: 638-8456.*

Vaccines and Screenings Through the Boston University Medical Center, free vaccinations educational programs, and health screenings are provided to the community. These include annual influenza vaccinations and screenings for skin cancer, prostate cancer, glaucoma, and osteoporosis. Educational programs include cancer awareness, teenage pregnancy, and first aid. In Fall 1993, some 2,200 elders received free flu shots in over 30 locations in the City of Boston. *Information: 638-6140.*

The Arthritis Center Center staff is active in a number of community efforts for arthritis patients in the inner city of Boston, including providing professional staff at Boston City Hospital, at the Evans Medical Clinic of Boston University Medical Center Hospital, and participating in community programs including arthritis support groups, service on medical advisory boards, and speaking to patient group. *Information: 638-4318.*

Free dental screenings have been offered by the Dental School since 1981. On selected Open House Days, new patients can receive an initial dental exam, X-rays, and oral health screening. More than 300 Boston residents took advantage of this program last year. *Information: 638-5079.*

Dental Health Plans for basic preventive care and dental services have been offered to Boston area public school students since 1985. Schools participate in a program offering their students biannual examinations and care on a prepaid plan at much lower cost than regular dental health plans. *Information: 638-4700.*

A Special Needs Dental Program, run by the Dental School, sends doctors and students to more than 600 sites throughout Massachusetts to provide basic dental care to children and adults with disabilities. More than 5,800 patients are seen yearly in early intervention programs, Chapter 766 school programs, adult day programs and workshops, and community residential programs. *Information: 638-4891.*

Dental Health Centers Through the School of Graduate Dentistry, Boston University provides quality dental care in state-of-the-art clinics at reasonable rates to all residents of Greater Boston. *Information: 638-4671, 739-0033.*

The Sargent Clinic at Boston University is a multi-service clinic in audiology, occupational therapy, physical therapy, and speech-language pathology, with vocational rehabilitation services and a fitness center. Speciality programs include: a Foot and Ankle Clinic, Postural Screening services with a state-funded program to train school health personnel in early detection of such disorders as scoliosis and lordosis; WordMoves, a program for preschool children with language/motor problems; plus seminars and workshops. *Information: 353-8383.*

The **Danielsen Institute** provides discounted, direct mental health therapy services to individuals, couples, groups, families, and special focus groups in the Greater Boston area. *Information: 353-3047.*

Nurse-Midwifery Education Program educates and prepares registered nurses to deliver comprehensive primary health care to women and children, particularly those from under-served areas. The Programs also staffed an ambulatory clinic at the Waltham-Weston Hospital for low income women, providing prenatal, postnatal, and well-women care. *Information: 638-5012.*

Geriatric Health Care Training Program is a six-week certificate program for health and human service elderly care providers offered at no cost to participants. Its purpose is to increae the number of minority providers, especially for at-risk and vulnerable communities. *Information: 638-5042.*

Urban Enviromental Health is a course of the School of Public Health that deals with environmental health issues issues specifically targeted to the Dudley Street neighborhood in the South End. In addition to the course work, students volunteer hundreds of hours in the community designing programs and providing information on environmental health. *Information: 638-4620.*

Community Education Programs The School of Public Health frequently co-sponsors education programs for the health and human services community. In 1993, topics included "Homeless Elders," "Conflict Resolution for Community Health Centers," Managed Care for Elders," and "Health Reform in Communities of Color." *Information: 638-5042.*

Medicaid Working Group is a partnership to develop new reimbursement and clinical care programs for people with servere disabilities or chronic illness; it is funded by grants from the Robert Wood Johnson Foundation and the Pew Charitable Trusts. The Medicaid Working Group will work with selected Medicaid programs, HCFA, and experienced health care providers throughout the state to implement these new models of care. *Information: 638-5042.*

Public Information and Technical Assistance Many members of the Medical Center faculty provide information and technical assistance to constituencies throughout Massachusetts. The faculty offer expert testimony to legislators, speak at public meetings and legislative briefings, serve as panel members and moderators at meetings, and are available to the media for interviews or to provide background information. *Information: 638-5042.*

Access and Affordability Monitoring Project identifies problems of unequal access to health care and high cost in our state, investigates their causes, monitors the progress or public and private efforts to ameliorate them, and designs alternative solutions. *Information: 638-6442.*

Social Action Outreach Programs and Services

Habitat for Humanity, Each Saturday, volunteers work with the local affiliates of Habitat for Humanity to construct affordable housing for low income families. Construction skills are helpful, but not necessary. Volunteers contributed 780 hours of service in 1993-94. *Information: 353-4710.*

Community Servings Volunteers bring hot, nutritious lunches to homebound people with AIDS and their families. This program also offers a lunch-hour volunteer experience which helps people avoid the need for hospitalization. Some 2,500 hours of service were contributed in 1993-94. *Information: 353-4710.*

Alternative Breaks Volunteers contributed almost 4,500 hours of service in 1993-94 by volunteering for a week during both winter and spring breaks. Volunteers travel to different states to do a variety of selected community service projects, including hurricane relief, intercultural environmental, and human services. *Information: 353-4710.*

Take Action volunteers contributed 133 hours of service by addressing the issues of hunger and homelessness. This was achieved through advocacy, education, health care programs, and direct service. *Information: 353-4710.*

The Student Food Rescue Program, Volunteers of this program contributed 2,500 hours of service salvaging and transporting over 260,000 pounds of surplus food. The food is donated by local restaurants, supermarkets, bakeries, and dining halls and is provided to area meal programs, food pantries, and shelters. *Information: 353-4710.*

United Way In addition to serving on advisory boards and volunteering to many United Way Agencies, the employees of Boston University generously support the United Way of Massachusetts Bay. In the 1993-94 campaign, faculty and staff contributed more than $147,000 to the United Way. *Information: 353-3560.*

The Boston Can Share drive for donations of canned goods is supported annually by a major drive at Boston University Medical Center Hospital. The donated goods are distributed through the Boston Food Bank to more than 200 food pantries. *Information: 638-8552.*

U-Help is an annual fund drive conducted among Boston University Medical Center Hospital employees to provide special funds for patients with emergency needs. Often the funds are used to assist the patient's family with expenses or compensation for lost pay while they stay with a sick relative. *Information: 638-8990.*

Servathon Volunteers contributed 640 hours in one day of service in October 1993 doing work in the community while generating support for the University's Community Service Center. Participants collected sponsorship from friends, families, faculty and administrators in support of the service projects done in the area. *Information: 353-4710.*

Recycling Program Run by the Community Service Center, this program organizes and promotes the conservation of natural resources by collecting and recycling office paper, newspaper, glass, aluminum, and plastic at established on-campus collection sites. Some 69,000 pounds of white paper were recycled. *Information: 353-4710.*

12-Step Groups are given space and support by Marsh Chapel throughout the year. Several twelve-step programs, including Overeaters Anonymous, Al-Anon, and Alcoholics Anonymous hold weekly meetings at the Chapel throughout the year. *Information: 353-3560*

OXFAM Fast for World Hunger at Boston University was established in 1988. In 1993, 1,700 gave up their meals on November 18 and raised $6,876 for hunger relief in the United States and abroad. For five consecutive years, Boston University has raised more money for this program than any other college/university in the country. *Information: 353-4710.*

Thanksgiving Baskets was a student run program that raised money, assembled, and distributed 74 "baskets" of food (three days worth of food products) for people who are hungry in Allston, Brighton, and Chelsea. *Information: 353-4710.*

The Siblings Program, run by the Community Service Center, links students at the University with children in the Winship Elementary School in Brighton The older students provide role models and companionship to the younger children as well as someone who can share cultural, recreational, and educational experience. *Information: 353-4710.*

Playgroup Volunteers from the University accompanied elementary school aged children from local shelters on outings throughout the City. Trips included visits to the Children's Museum and puppet shows. *Information: 353-4710.*

Our Place is a program of the Community Service Center where volunteers play and interact with toddlers and pre-school aged children in a local day care center for homeless children. *Information: 353-4710.*

Social, Cultural, and Intellectual Programs and Services

Boston University is a center of cultural and intellectual activity. On average, there are 250 lectures, performances, and other events each week during the academic year, emanating from the fifteen schools and colleges of the University. These events include exhibits in the arts, worship services, recreational events, lectures, workshops, conferences, social events, and performances. Most of these events are offered free of charge or for a nominal fee and are open to the public. A listing of these events are included each week in the University's newspaper *Boston University Today*. The following listing illustrates the variety of activities available to the community.

The Boston University Libraries Boston University welcomes members of the community to utilize its main research library, the Mugar Memorial Library. With nearly 5 million volumes and volume equivalents, and thousands of journals, the Boston University Libraries complement school and community libraries of the cities surrounding the University. *Information: 353-3710.*

Special Collections contains the University's rare book, archival, and manuscript collections. Chief among its holdings are the collections of more than 1,600 American and European figures prominent in 20th century public life and the arts. The department also includes scores from the Boston Symphony Orchestra, the History of Nursing Archive, the Abraham Lincoln and Theodore Roosevelt Collections, the Mystery Writers of America Library, the Robert Frost Collection and many other historical documents and letters. The department is open to the public and regularly sponsors exhibits of its collections throughout Mugar Library. *Information: 353-3696.*

Author Events The Charlesbank Bookshop, holds numerous author readings and discussions during the year. These events provide a stimulating environment for the exchange of ideas. All author readings are simultaneously translated into sign language for the hearing impaired. *Information: 236-7421.*

Boston University Art Gallery Numerous free exhibitions are held each year and are open to the public. Exhibitions include some of the finest contemporary art and craftsmanship displayed in the Boston area. In addition, special programs are often held in conjunction with exhibitions. These include educational tours for school groups, lectures, panel discussions, film series, and poetry reading. *Information: 353-3329.*

The Music Division at Boston University is one of the few university-based conservatory quality schools of music in the country. Students and faculty at the school perform in more than 400 musical events throughout the year, all of which are open to the public and are most often free of charge. The Boston University Orchestra has long been hailed by critics, and the Empire Brass Quintet and Muir String Quartet are both Naumburg award winners. ALEA III, a contemporary music ensemble, and two performing collegiums in Early Music and Contemporary Music also perform regularly. The University Chorus produces four major choral concerts each year, and the highly acclaimed Opera Department stages two full productions annually, as well as shorter offerings. Special performances for schools, nursing homes, and other events are frequently arranged throughout the school year. *Information: 353-3345.*

Lecture Series Each year, the University offers a variety of lectures open to the public, many free of charge. Lectures are given by University faculty and distinguished visitors and cover a wide variety of topics such as art history, philosophy, religion, current issues, translations, archaeology, finance, and health-related issues.

Greater Boston Youth Symphony Orchestra Talented music students, ages 12 to 18, from the communities surrounding the University are invited to participate in this program. The Orchestra has performed at sites across the nation, including Symphony Hall in Boston and the White House. *Information: 353-3348.*

The Boston University Tanglewood Institute was started in 1965 to give high school students many of the educational and musical opportunities enjoyed by older musicians at the Tanglewood Music Center in Lenox, Massachusetts, the summer home of the Boston Symphony Orchestra. Young musicians study for one to two months under dedicated, professional teachers. Proximity to the Boston Symphony Orchestra makes this a superb opportunity for immersion into the world of professional music by young students. *Information: 353-3386.*

Marsh Chapel Services of Worship Every Sunday of the academic year, Marsh Chapel holds the University's Protestant, interdenominational Service of Worship. The service is also broadcast on WBUR and attracts a listenership of some 85,000. In addition, the Chapel also conducts an interdenominational Protestant service of worship in the Japanese language on a weekly basis. The services are open to the public. *Information: 353-3560.*

Marsh Chapel also conducts a weekly lunchtime lecture series of pertinent and timely subjects, a program of choral and instrumental music, and a series of poetry readings and related literary events. *Information: 353-3560.*

Music Teach is a program of the Community Service Center where volunteers provide instrumental music lessons to children at the Edison Middle School in Brighton. *Information: 353-4710.*

Boston University Theatre Arts Division The University's nationally recognized Theatre Arts Division stages several public productions each year. *Information: 353-3345.*

Huntington Theatre Company The University is a major sponsor of this non-profit professional theater company that performs at the University's theatre on Huntington Avenue. Six productions are presented each year to audiences of more than 142,000. The theater also offers several community service programs, including the Student Matinee Series, the Young Critics Institute, the Humanities Forum at the Huntington Theatreand the Huntington Speakers Bureau. *Information: 266-7900.*

Children's Theatre Volunteers contributed some 1,500 hours in 1993-94 developing and performing a traveling entertainment show. The show was performed for children in hospitals, schools, shelters, and community centers. *Information: 353-4710.*

Intercollegiate Athletics Varsity events are open to the public and tickets are regularly donated to underprivileged children and to civic groups such as YMCAs and community centers. *Information: 353-3838.*

Athletic and Recreational Facilities are available for local high school use. Students from the School of Education sponsor weekly programs at the Case Physical Education Center for students from Boston. In addition, free ice time is provided for youth hockey programs, and the indoor track at the Commonwealth Armory is made available to public schools. *Information: 353-4632, 353-3300.*

MACE Summer Project is a summer recreational and educational program for children ages 5-12 who reside in the MACE housing development in Chelsea. *Information: 353-4710.*

Sharpshooters Volunteers of the Community Service Center were paired as mentors with inner-city middle school children to teach them the skills and rewards of photography. *Information: 353-4710.*

Events sponsored by the Office of Government and Community Affairs have included the Roxbury Boys and Girls Club Shoot-Out, the Boston Boy Scouts Council, and Boston YMCA Benefit Basketball. *Information: 353-9095.*

Holiday Parties are organized annually by the Office of Government and Community Affairs, as well as students, faculty, and staff of the University at locations such as the Thomas Gardner School in Brighton, the Lynch Recreation Center in Brookline, and youth and senior centers in Chelsea. Similar parties are organized each year by University fraternities and sororities. *Information: 353-4710, 353-9095.*

Radio Station WBUR 90.0 FM This University-owned and supported radio station broadcasts local, national, and international news, lectures, sports events, classical music, jazz, folk and popular music, and arts and entertainment commentaries to the Greater Boston area, eastern and southern Massachusetts including Cape Cod, and parts of Rhode Island and New Hampshire. The station is qualified by the Corporation for Public Broadcasting, and is also a member of National Public Radio and an affiliate of American Public Radio. One of the most prestigious public radio stations in the country, WBUR has won 3 George Foster Peabody Awards, 4 Major Armstrong Awards for excellence in programming, and 37 Massachusetts Associated Press Awards, including 8 in 1993. *Information: 353-2790.*

Neighborhood Network News Boston University provides studio facilities for the Neighborhood Network News (Boston Cable Access Television) which provides access and service to approximately 200 local organizations and agencies. In addition, the station provides reports on educational systems, politics, and community services to its viewers. *Information: 353-9700.*

Judson Boardman Coit Memorial Observatory Each Wednesday evening, visibility permitting, the Astronomy Department opens the University observatory to the public free of charge. Many lectures and presentations are sponsored in conjunction with this program which have included live telecasts of NASA's historic Voyager 2 flight to Neptune, observing of lunar and solar eclipses, telecasts of space shuttle and space craft missions, and other special events as they occur. The department also frequently hosts school groups from the surrounding Boston metropolitan area. *Information: 353-2630 (observatory); 353-5700 (curator).*

Attachment 4
Boston University
Summary of Federal Grant and Contract Activity
Fiscal Years 1990-1994

SUMMARY OF FEDERAL GRANT AND CONTRACT ACTIVITY

FY 1990 -- FY 1994

Department of Biology

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Baum, Michael 7706-5	Behavioral Effects of Sex Steroids	Department of Health and Human Services	04/01/89 -- 03/31/90	6,717
Baum, Michael 0786-6	Opioid Regulation of LH Secretion in the Ferret (G. Lambert)	Department of Health and Human Services	03/01/90 -- 02/28/91	11,500
Baum, Michael 7947-5	Behavioral Effects of Sex Steroids	Department of Health and Human Services	04/01/90 -- 03/31/91	47,565
Baum, Michael 7950-5	Differentiation of Sexual Behavior	Department of Health and Human Services	04/01/90 -- 03/31/91	183,916
Baum, Michael 8207-5	Behavioral Effects of Sex Steroids	Department of Health and Human Services	04/01/91 -- 03/31/92	59,389
Baum, Michael 0901-6	Opioid Regulation of LH Secretion in the Ferret (G. Lambert)	Department of Health and Human Services	03/01/91 -- 02/29/92	11,800
Baum, Michael 8450-5	Differentiation of Sexual Behavior	Department of Health and Human Services	02/01/92 -- 01/31/93	153,283
Baum, Michael 8544-5	Behavioral Effects of Sex Steroids	Department of Health and Human Services	06/01/92 -- 03/31/93	60,939
Baum, Michael 8730-5	Differentiation of Sexual Behavior	Department of Health and Human Services	02/01/93 -- 01/31/94	155,356
Baum, Michael 8749-5	Behavioral Effects of Sex Steroids	Department of Health and Human Services	04/01/93 -- 03/31/94	63,608
Baum, Michael 9000-5	Differentiation of Sexual Behavior	Department of Health and Human Services	02/01/94 -- 01/31/95	163,317
Baum, Michael 9022-5	Behavioral Effects of Sex Steroids	Department of Health and Human Services	04/01/94 -- 03/31/95	66,024
Callard, Gloria 7823-5	Testicular Steroidogenesis in Selected Models	Department of Health and Human Services	08/01/89 -- 07/31/90	151,366

SUMMARY OF FEDERAL GRANT AND CONTRACT ACTIVITY

FY 1990 -- FY 1994

Department of Biology

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Callard, Gloria 7823-5	Testicular Steroidogenesis in Selected Models	Department of Health and Human Services	08/01/89 -- 07/31/90	26,772
Callard, Gloria 7970-5	Aromatization in Brain and Pituitary Role in Regulating Reproduction in Vertebrates	National Science Foundation	04/01/90 -- 09/30/91	89,750
Callard, Gloria 7823-5	Testicular Steroidogenesis in Selected Models	Department of Health and Human Services	08/01/89 -- 11/30/90	57,683
Callard, Gloria 8130-5	Testicular Steroidogenesis in Selected Models	Department of Health and Human Services	12/01/90 -- 11/30/91	160,921
Callard, Gloria 7970-5	Aromatization in Brain and Pituitary Regulation of Reproduction in Vertebrates	National Science Foundation	04/01/91 -- 09/30/92	86,500
Callard, Gloria 8413-5	Testicular Steroidogenesis in Selected Models	Department of Health and Human Services	12/01/91 -- 11/30/92	165,822
Callard, Gloria 7970-5	Aromitization in Brain and Pituitary: Regulation of Reproduction in Vertebrates	National Science Foundation	04/01/92 -- 09/30/93	91,000
Callard, Gloria 7970-5	Aromatization in Brain and Pituitary: Regulation of Reproduction in Vertebrates	National Science Foundation	04/01/93 -- 09/30/94	95,500
Callard, Gloria 7970-5	Aromatization in Brain and Pituitary: Regulation of Reproduction in Vertebrates	National Science Foundation	04/01/94 -- 09/30/95	100,000
Callard, Ian 8258-5	Regulation of Apolipoprotein Metabolism: A Turtle Model	Department of Health and Human Services	06/01/91 - 05/31/92	204,344
Callard, Ian 1048-6	Endocrine Mechanisms in Vertebrate Reproduction	Department of Health and Human Services	07/01/92 -- 06/30/93	53,740

SUMMARY OF FEDERAL GRANT AND CONTRACT ACTIVITY

FY 1990 -- FY 1994

Department of Biology

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Callard, Ian 8552-5	Regulation of Apolipoprotein Metabolism: A Turtle Model	Department of Health and Human Services	06/01/92 -- 05/31/93	152,753
Callard, Ian 1166-6	Endocrine Mechanisms in Vertebrate Reproduction	Department of Health and Human Services	07/01/93 -- 06/30/94	52,856
Callard, Ian 8805-5	Regulation of Apolipoprotein Metabolism: A Turtle Model	Department of Health and Human Services	06/01/93 -- 05/31/94	152,374
Callard, Ian 1283-6	Endocrine Mechanisms in Vertebrate Reproduction	Department of Health and Human Services	07/01/94 -- 06/30/95	45,267
Eldred, William 7804-5	EM of Neural Circuits in Inner Pleniform Layer of Retina	Department of Health and Human Services	08/01/89 -- 07/31/90	239,104
Eldred, William 8042-5	Regional Synaptic Specializations in the Retina	Department of Health and Human Services	08/01/90 -- 07/31/91	197,954
Eldred, William 8322-5	Regional Synaptic Specializations in the Retina	Department of Health and Human Services	08/01/91 -- 07/31/92	212,812
Eldred, William 8606-5	Regional Synaptic Specializations in the Retina	Department of Health and Human Services	08/01/92 -- 07/31/93	207,251
Eldred, William 8862-5	Regional Synaptic Specializations in the Retina	Department of Health and Human Services	08/01/93 -- 07/31/94	215,878
Godrick, Elizabeth 0589-6	The Elementary Teacher as a Science Instructor	National Science Foundation	02/15/88 -- 11/30/90	18,300
Godrick, Elizabeth 1018-6	A Modular Integrated Laboratory for Introductory Biology	National Science Foundation	03/15/92 -- 08/31/94	150,396
Kunz, Thomas 1140-6	Undergraduate Research Participation: Collaborative Cross Disciplinary Research in Biology	National Science Foundation	04/15/93 -- 09/30/94	51,250

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Kunz, Thomas 1272-6	REU: Collaborative Cross-Disciplinary Research in Biology	National Science Foundation	05/01/94 -- 04/30/95	52,101
Kunz, Thomas 8994-5	Dissertation Research: Energetic Demands of Production of Young in the Chiropteran Species, Phyllostomus hastatus	National Science Foundation	02/01/94 -- 08/31/96	11,940
Lajtha, Kate Bloomer, Sherman 8245-5	Undergraduate Laboratories in Environmental Sciences: Environmental Analysis and Monitoring in an Urban Setting	National Science Foundation	04/01/91 -- 09/30/93	23,758
Lajtha, Kate 8080-5	Ecophysiological, Nutrient Cycling, and Toxic Element Cycling Studies	Department of the Interior	09/01/90 -- 08/31/91	20,000
Lajtha, Kate 8351-5	Ecophysiological, Nutrient Cycling, and Toxic Element Cycling Studies	Department of the Interior	08/01/91 -- 01/31/93	25,000
Lajtha, Kate 8536-5	Saguaro Population Dynamics	Department of the Interior	06/01/92 --01/31/93	2,500
Lajtha, Kate 8696-5	Assimilative Capacity and Retention of Heavy Metals Between Component Ecosystems within Danube Delta	Environmental Protection Agency	10/15/92 -- 10/14/93	24,992
Lin, Jen-Wei 9019-5	Release Mechanisms and Plasticity at a Tonic Synapse	Department of Health and Human Services	03/01/94 -- 03/31/95	100,746
Primack, Richard 7675-5	Maintenance of Rare Species in the Dipterocarp Rain Forests of Borneo, Phase II	National Science Foundation	03/15/90 -- 08/31/91	71,152
Primack, Richard 8108-5	Biological Diversity, Conservation, Utilization, and Rehabilitation of Tropical Forests in the Western Ghats of Karnataka State, India	Department of State	10/16/90 -- 10/15/93	49,928

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Primack, Richard 8551-5	A Regional Approach for Sustainable Development and the Conservation of Natural Resources	Department of State	06/01/92 -- 06/30/93	59,757
Primack, Richard 8655-5	CRB: Dispersal and Disturbance as Factors Limiting the Distribution of Rare Plant Species	National Science Foundation	09/01/92 -- 02/29/96	130,000
Primack, Richard 8901-5	A Regional Approach for Sustainable Development end the Conservation of Natural Resources	Department of State	07/01/93 -- 08/31/94	67,495
Primack, Richard 8925-5	Dispersal and Disturbance as Factors Limiting the Distribution of Rare Plant Species at the Savannah River Forest Site	Department of Agriculture	09/01/93 -- 08/30/96	50,000
Shepro, David 7878-5	Physiological Regulation of Microvascular Permeability	Department of Health and Human Services	12/01/89 -- 12/31/90	202,486
Shepro, David 8047-5	Endothelial Cell Communication in Homeostasis	Department of Health and Human Services	07/01/90 -- 06/30/91	147,394
Shepro, David 8161-5	Physiological Regulation of Microvascular Permeability	Department of Health and Human Services	01/01/91 -- 12/31/91	205,519
Shepro, David 8161-5	Physiological Regulation in Microvascular Permeability	Department of Health and Human Services	01/01/91 -- 12/31/91	4,723
Shepro, David 8447-5	Physiological Regulation of Microvascular Permeability	Department of Health and Human Services	01/01/92 -- 12/31/92	218,651
Shepro, David 8632-5	Pericyte Contractility and Microvascular Permeability	Department of Health and Human Services	08/01/92 -- 07/31/93	199,953
Shepro, David 8723-5	Physiological Regulation of Microvascular Permeability	Department of Health and Human Services	01/01/93 -- 12/31/93	212,939

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Shepro, David 8998-5	Physiological Regulation of Microvascular Permeability	Department of Health and Human Services	01/01/94 -- 12/31/94	223,506
Shepro, David 8865-5	Pericyte Contractility and Microvascular Permeability	Department of Health and Human Services	08/01/93 -- 07/31/94	208,112
Tamarin, Robert 8066-5	Minisatellite DNA, Kinship and Population Processes in Voles	National Science Foundation	08/15/90 -- 07/31/92	25,000
Traniello, James 1277-6	The Use of Radionuclides as Colony-Specific Markers in Termite Population Biology	International Atomic Energy Agency	06/01/94 -- 11/01/94	12,000

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Ahlen, Steven 7640-5	Basic Particle Physics	National Science Foundation	12/15/88 -- 10/31/91	196,000
Ahlen, Steven 7640-5	Basic Particle Physics at Boston University	National Science Foundation	02/01/91 -- 10/31/92	200,000
Ahlen, Steven 8238-5	Particle Tracking Simulation and Data Analysis for Testing and Developing the SSC's Detectors	State of Texas/National Research Laboratory Commission	04/01/91 -- 03/31/92	25,000
Ahlen, Steven 8055-5	MAGPIE: A Magnetic Passive Isotope Experiment	National Aeronautics and Space Administration	03/01/90 -- 02/28/91	115,000
Ahlen, Steven 7640-5	Basic Particle Physics at Boston University	National Science Foundation	02/01/91 -- 10/31/92	15,000
Ahlen, Steven 8055-5	MAGPIE: A Magnetic Passive Isotope Experiment	National Aeronautics and Space Administration	03/01/91 -- 02/28/92	85,000
Ahlen, Steven 8055-5	MAGPIE: A Magnetic Passive Isotope Experiment	National Aeronautics and Space Administration	03/01/92 -- 02/28/93	100,000
Ahlen, Steven 8744-5	Electroweak Symmetry Studies at LEP and SSC with the L3 and GEM Detectors	National Science Foundation	03/15/93 -- 08/31/94	165,000
Ahlen, Steven 8602-5	R & D for the PDT Option of the GEM Muon System	Texas National Research Laboratory Commission	06/01/92 -- 05/31/93	35,000
Ahlen, Steven 8055-5	Magnetic Spectroscopy Studies of Galactic Cosmic Rays: MAGPIE and SMILI	National Aeronautics and Space Administration	03/01/93 -- 02/28/94	120,000
Ahlen, Steven 8744-5	Electroweak Symmetry Studies at LEP and SSC with the L3 and GEM Detectors	National Science Foundation	03/15/94 -- 08/31/95	165,000
Ahlen, Steven 8055-5	MAGPIE: A Magnetic Passive Isotope Experiment	NASA	03/01/94 -- 02/28/95	120,000

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Department of Physics

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Chivukula, Sekhar 8089-5	Presidential Young Investigator Award: Theoretical Physics	National Science Foundation	08/01/90 -- 01/31/92	50,000
Chivukula, Sekhar 8089-5	Presidential Young Investigator Award: Theoretical Physics	National Science Foundation	08/01/91 -- 01/31/93	25,000
Chivukula, Sekhar 8605-5	Research in Particle Physics/Task N: Topics in Elementary Particle Physics	Department of Energy	06/01/92 -- 01/31/93	25,000
Chivukula, Sekhar 8605-5	Research in Particle Physics/Task N: Topics in Elementary Particle Physics	Department of Energy	02/01/93 -- 01/31/94	25,000
Chivukula, Sekhar 8089-5	Presidential Young Investigator Award Theoretical Physics	National Science Foundation	08/01/92 -- 01/31/94	62,500
Chivukula, Sekhar 8089-5	Presidential Young Investigator Award Theoretical Physics	National Science Foundation	08/01/93 -- 01/31/95	62,500
Chivukula, Sekhar 8605-5	Research in Particle Physics/Task N Topics in Elementary Particle Physics	Department of Energy	02/01/94 -- 01/31/95	25,000
Cohen, Andrew 8337-5	Topics in Particle Physics	Department of Energy	09/01/91 -- 05/31/92	30,000
Cohen, Andrew 8337-5	Research in Particle Physics/Task J: Topics in Particle Physics	Department of Energy	06/01/92 -- 01/31/93	23,694
Cohen, Andrew 8337-5	Research in Particle Physics/Task J: Topics in Particle Physics	Department of Energy	02/01/93 -- 01/31/94	40,000
Cohen, Andrew 8337-5	Research in Particle Physics/Task J: Topics in Particle Physics	Department of Energy	02/01/94 -- 01/31/95	40,000
Dye, Stephen 8112-5	Preliminary Design Study of a Fast Digitizing Chip for the DUMAND II String Bottom Controller (Subcontract via University of Hawaii)	Department of Energy	07/01/90 -- 11/30/90	10,000

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Dye, Stephen Mavretic, Anton 8366-5	Engineering Design and Testing of a Fast Digitizing Circuit for the DUMAND-II Experiment	The Research Corporation of the University of Hawaii	12/01/90 -- 11/30/91	85,000
Dye, Stephen 8601-5	Fast-Time Digitizer System for the DUMAND-II Experiment (Subcontract via The Research Corporation of the University of Hawaii)	Department of Energy	04/01/92 -- 11/30/92	83,700
Dye, Stephen Sulak, Lawrence 8525-5	Research in Particle Physics/Task D: Neutrino Astrophysics and Proton Decay	Department of Energy	03/01/92 -- 01/31/93	117,405
Dye, Stephen 8695-5	Construction of Equipment for Beam Tests at KEK (Subcontract via University of California at Irvine)	Department of Energy	08/01/92 -- 01/31/93	60,000
Dye, Stephen Sulak, Lawrence 8525-5	Research in Particle Physics/Task D: Neutrino Astrophysics and Proton Decay	Department of Energy	02/01/93 -- 01/31/94	240,000
Dye, Stephen Sulak, Lawrence 8860-5	Research in Particle Physics/Task D: Neutrino Astrophysics and Proton Decay (Equipment)	Department of Energy	02/01/93 -- 01/31/94	35,000
Dye, Stephen 8601-5	Fast-time Digitizer System for the DUMMAND-II Experiment (Subcontract via the Research Corporation of the University of Hawaii)	Department of Energy	04/01/92 -- 01/31/94	30,000
Dye, Stephen Sulak, Lawrence 8525-5	Research in Particle Physics/Task D: Neutrino Astrophysics and Proton Decay	Department of Energy	02/01/94 -- 01/31/95	245,000
Dye, Stephen Sulak, Lawrence 8860-5	Research in Particle Physics/Task D: Neutrino Astrophysics and Proton Decay (Equipment)	Department of Energy	02/01/94 -- 01/31/95	30,000

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Goldberg, Bennett 8326-5	Presidential Young Investigator Award	National Science Foundation	08/01/91 -- 01/31/93	59,000
Goldberg, Bennett 1017-6	Presidential Young Investigator Award	National Science Foundation	10/15/91 -- 01/31/93	9,500
Goldberg, Bennett 8209-5	Dimensionally Self-Regulating Materials (Subcontract via University of Oklahoma)	Department of Defense	04/01/91 -- 04/30/92	64,143
Goldberg, Bennett 8209-5	Dimensionally Self-Regulating Materials (Subcontract via University of Oklahoma)	Department of Defense	04/01/91 -- 04/30/93	63,738
Goldberg, Bennett 8326-5	Presidential Young Investigator Award	National Science Foundation	08/01/92 -- 01/31/93	49,000
Goldberg, Bennett 1017-6	Presidential Young Investigator Award	National Science Foundation	12/15/92 -- 01/31/94	9,944
Goldberg, Bennett 8209-5	Dimensionally Self-Regulating Materials (Subcontract via University of Oklahoma)	Department of Defense	05/01/93 -- 04/30/94	67,685
Goldberg, Bennett 8326-5	Presidential Young Investigator Award	National Science Foundation	08/01/93 -- 01/31/95	76,763
Goldberg, Bennett 1017-6	Presidential Young Investigator Award	National Science Foundation	08/01/94 -- 01/31/95	9,975
Klein, William Ludwig, Karl 8011-5	Kinetics of Phase Transformations	National Science Foundation	06/01/90 -- 11/30/91	115,800
Klein, William Ludwig, Karl 8011-5	Kinetics of Phase Transformations	National Science Foundation	06/01/90 -- 11/30/91	6,500
Klein, William Ludwig, Karl 8011-5	Kinetics of Phase Transformations	National Science Foundation	06/01/91 -- 11/30/92	114,900

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Klein, William Ludwig, Karl 8260-5	Kinetics of Phase Transformations	National Science Foundation	06/01/91 -- 11/30/92	13,500
Klein, William Ludwig, Karl 8011-5	Kinetics of Phase Transformations	National Science Foundation	06/01/91 -- 11/30/92	18,700
Klein, William Ludwig, Karl 8573-5	Kinetics of Phase Transformations	National Science Foundation	06/01/92 -- 11/30/93	91,500
Klein, William Ludwig, Karl 8690-5	Kinetics of Phase Transformations (Graduate Student Support)	National Science Foundation	06/01/92 -- 11/30/93	23,100
Klein, William Ludwig, Karl 8573-5	Kinetics of Phase Transformations (Minority Graduate Student Support)	National Science Foundation	06/01/92 -- 11/30/93	17,437
Klein, William Ludwig, Karl 8260-5	Kinetics of Phase Transformations (Undergraduate Support)	National Science Foundation	06/01/92 -- 11/30/93	9,000
Klein, William Ludwig, Karl 8858-5	Kinetics of Phase Transformations	National Science Foundation	05/01/93 -- 01/31/95	107,812
Klein, William Ludwig, Karl 8858-5	Kinetics of Phase Transformations	National Science Foundation	05/01/94 -- 01/31/96	97,812
Klein, William Ludwig, Karl 8858-5	Kinetics of Phase Transformations	National Science Foundation	05/01/93 -- 01/31/95	43,778

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Krienan, Frank 7969-5	Research Accomplishments and Future Goals in Particle Physics/Task B: Accelerator Design Physics	Department of Energy	06/01/89 -- 05/31/90	100,000
Knenan, Frank 7969-5	Research Accomplishments and Future Goals in Particle Physics/Task B: Accelerator Design Physics	Department of Energy	06/01/90 -- 10/31/90	15,000
Krienan, Frank 7969-5	Research Accomplishments and Future Goals in Particle Physics/Task B: Accelerator Design Physics	Department of Energy	06/01/90 -- 05/31/91	50,000
Krienan, Frank 7969-5	Research Accomplishments and Future Goals in Particle Physics/Task B: Accelerator Design Physics	Department of Energy	06/01/91 -- 10/31/91	20,907
Krienan, Frank 8523-5	Research in Particle Physics/Task B: Accelerator Design in Physics	Department of Energy	03/01/92 -- 01/31/93	86,420
Krienan, Frank 8523-5	Research in Particle Physics/Task B: Accelerator Design Physics	Department of Energy	02/01/93 -- 01/31/94	110,000
Krienen, Frank 7969-5	Research Accomplishments and Future Goals in Particle Physics/Task B: Accelerator Design Physics	Department of Energy	06/01/91 -- 05/31/92	29,093
Krienen, Frank Roberts, B. Lee 8999-5	Accelerator Design Physics	Department of Energy	02/01/94 -- 02/14/95	100,000
Lane, Kenneth Pi, So-Young Rebbi, Claudio 7754-5	Research Accomplishments and Future Goals in Particle Physics/Task E: Theoretical Particle Physics	Department of Energy	06/01/89 -- 01/31/90	62,099

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Lane, Kenneth Pi, So-Young Rebbi, Claudio 7754-5	Research Accomplishments and Future Goals in Particle Physics/Task E: Theoretical Particle Physics	Department of Energy	06/01/89 -- 05/31/90	64,787
Lane, Kenneth Pi, So-Young Rebbi, Claudio 7754-5	Research Accomplishments and Future Goals in Particle Physics/Task E: Theoretical Particle Physics	Department of Energy	06/01/90 -- 10/31/90	201,332
Lane, Kenneth Pi, So-Young Rebbi, Claudio 7754-5	Research Accomplishments and Future Goals in Particle Physics/Task E: Theoretical Particle Physics	Department of Energy	06/01/90 -- 05/31/91	156,798
Lane, Kenneth Pi, So-Young Rebbi, Claudio 7754-5	Research Accomplishments and Future Goals in Particle Physics/Task E: Theoretical Particle Physics	Department of Energy	06/01/90 -- 10/31/90	12,870
Lane, Kenneth Pi, So-Young Rebbi, Claudio 7754-5	Research Accomplishments and Future Goals in Particle Physics/Task E: Theoretical Particle Physics	Department of Energy	06/01/91 -- 10/31/91	243,786
Lane, Kenneth Pi, So-Young Rebbi, Claudio 7754-5	Research Accomplishments and Future Goals in Particle Physics/Task E: Theoretical Particle Physics	Department of Energy	06/01/91 -- 05/31/92	127,214
Lane, Kenneth Pi, So Young Rebbi, Claudio 8526-5	Research in Particle Physics Task E: Theoretical Particle Physics	Department of Energy	03/01/92 -- 01/31/93	307,270

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Lane, Kenneth Pi, So Young Rebbi, Claudio 8526-5	Research in Particle Physics/Task E: Theoretical Particle Physics	Department of Energy	02/01/93 -- 01/31/94	467,000
Lane, Kenneth 8797-5	Physics at Super Collider Energies	Texas National Research Laboratory Commission	04/01/93 -- 06/30/94	70,000
Lane, Kenneth Pi, So-Young Rebbi, Claudio 8526-5	Research in Particle Physics/Task E: Theoretical Particle Physics	Department of Energy	02/01/94 -- 01/31/95	457,000
Lutchen, Kenneth 8264-5	Physics at Supercollider Energies	State of Texas/National Research Laboratory Commission	04/01/91 --06/30/92	75,000
Marin, Alex Ahlen, Steven 8265-5	U.S. - Italy Cooperative Research: High Energy Cosmic Rays with Macro Detector	National Science Foundation	04/15/91 -- 09/30/93	15,250
Miller, James Roberts, B. Lee Booth, Edward 7819-5	Photonuclear and Fundamental Particle Physics	National Science Foundation	08/15/89 -- 01/31/91	420,079
Miller, James Booth, Edward Roberts, B. Lee 7819-5	Photonuclear and Fundamental Physics	National Science Foundation	08/01/89 -- 01/31/92	412,625
Miller, James Booth, Edward Roberts, B Lee 7819-5	Photonuclear and Fundamental Particle Physics	National Science Foundation	08/01/91 -- 01/31/93	428,811

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Miller, James Roberts, B. Lee 8336-5	Electron Calorimeters for the Measurement of the MUON G-2	National Science Foundation	08/01/91 -- 01/31/93	318,567
Miller, James Roberts, B. Lee Booth, Edward 1090-6	Photonuclear and Fundamental Particle Physics	National Science Foundation	06/01/92 -- 01/31/93	8,480
Miller, James Roberts, B. Lee Booth, Edward 8659-5	Photonuclear and Fundamental Particle Physics	National Science Foundation	09/01/92 -- 02/28/94	457,131
Miller, James Booth, Edward Roberts, B. Lee 8659-5	Photonuclear and Fundamental Particle Physics	National Science Foundation	09/01/93 -- 02/28/95	454,095
Miller, James Booth, Edward Roberts, B. Lee 8659-5	Photonuclear and Fundamental Particle Physics	National Science Foundation	09/01/94 -- 02/29/96	454,752
Miller, James Booth, Edward Roberts, B. Lee 8891-5	Photonuclear and Fundamental Particle Physics	National Science Foundation	07/01/93 -- 02/28/95	9,810
Miller, James Booth, Edward Roberts, B. Lee 8891-5	Photonuclear and Fundamental Particle Physics	National Science Foundation	06/01/94 -- 02/29/96	12,592
Pi, So-Young 8377-5	U.S.-Korea Cooperative Research on Gauge Field Theories in the Schrodinger Picture	National Science Foundation	06/15/91 -- 02/28/94	10,540

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Rebbi, Claudio Strilka, Richard 7846-5	Graduate Research Assistantship in Parallel Processing (Subcontract via University of Maryland)	Department of Defense	09/01/89 -- 12/31/89	8,320
Rebbi, Claudio Strilka, Richard 7846-5	Graduate Research Assistantship in Parallel Processing (Subcontract via University of Maryland)	Department of Defense	09/01/89 -- 08/31/90	16,635
Rebbi, Claudio Strilka, Richard 7846-5	Graduate Research Assistantship in Parallel Processing (Subcontract via University of Maryland)	Department of Defense	09/01/89 -- 12/31/90	7,750
Rebbi, Claudio 7846-5	Graduate Research Assistantship in Parallel Processing (Subcontract via University of Maryland/College Park) (Richard Strilka)	Department of Defense	09/01/90 -- 06/30/91	15,480
Roberts, B. Lee 8282-5	MUON (G-2) Equipment (Subcontract via Brookhaven National Laboratory)	Department of Energy	04/10/91 - 05/31/93	100,000
Roberts, B. Lee 8282-5	MUON (G-2) Experiment (Subcontract via Brookhaven National Laboratory)	Department of Energy	04/10/91 -- 05/31/93	100,000
Roberts, B. Lee 8282-5	MUON (G-2) Experiment (Subcontract via Brookhaven National Laboratory)	Department of Energy	04/01/91 -- 05/31/93	167,000
Rohlf, James 7756-5	Research Accomplishments and Future Goals in Particle Physics/Task G: Hadron Collider Physics	Department of Energy	06/01/89 -- 01/31/90	56,739
Rohlf, James 7756-5	Research Accomplishments and Future Goals in Particle Physics/Task G: Hadron Collider Physics	Department of Energy	06/01/89 -- 05/31/90	58,744
Rohlf, James 7756-5	Research Accomplishments and Future Goals in Particle Physics/Task G: Hadron Collider Physics	Department of Energy	06/01/90 -- 10/31/90	90,000

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Rohlf, James 7975-5	Research Accomplishments and Future Goals in Particle Physics/Hadron Collider Physics Equipment	Department of Energy	06/01/89 -- 05/31/90	154,000
Rohlf, James 7975-5	Research Accomplishments and Future Goals in Particle Physics/Hadron Collider Physics Equipment	Department of Energy	06/01/90 -- 10/31/90	10,000
Shimony, Abner 7830-5	Investigations of Time	National Science Foundation	08/01/89 -- 01/31/91	10,000
Shimony, Abner 8221-5	Foundations of Quantum Mechanics	National Science Foundation	04/01/91 -- 09/30/93	72,000
Shimony, Abner 9078-5	Research in the Foundations of Quantum Mechanics	National Science Foundation	05/15/94 -- 04/30/95	40,000
Skocpol, William 8028-5	Consortium for Superconducting Electronics (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/90 -- 09/30/90	125,000
Skocpol, William 8056-5	Proximity - Coupled HTSC Materials and Devices	Department of Defense	08/15/90 -- 10/29/91	150,000
Skocpol, William 8028-5	Consortium for Superconducting Electronics (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/90 -- 02/15/91	93,750
Skocpol, William 8028-5	Consortium for Superconducting Electronics (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/90 -- 03/31/91	31,250
Skocpol, William 8370-5	Consortium for Superconducting Electronics High TcMaterials and Technology Program (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/91 -- 02/15/92	75,000

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Skocpol, William 8368-5	Consortium for Supercolliding Electronics Junctions, SQUIDS and Exploratory Devices Program (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/91 -- 02/15/92	30,000
Skocpol, William 8369-5	Consortium for Superconducting Electronics Signal Distribution and Conditioning Networks Program (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/91 -- 02/15/92	60,000
Skocpol, William 8056-5	Proximity - Coupled HTSC Materials and Devices	Department of Defense	11/01/91 -- 10/31/92	200,000
Skocpol, William 8369-5	Consortium for Superconducting Electronics Signal Distribution and Condition Networks Program (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/91 -- 02/15/92	20,000
Skocpol, William 8368-5	Consortium for Supercolliding Electronics Junctions, SQUIDS and Exploratory Devices Program (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/91 -- 09/30/92	22,000
Skocpol, William 8370-5	Consortium for Supercolliding Electronics High TcMaterials and Technology Program (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/91 -- 09/30/92	25,000
Skocpol, William 8570-5	High Tc Materials Program (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/91 -- 03/31/93	48,800

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Skocpol, William 8568-5	Low Noise Resonator/Oscillator Project (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/91 -- 03/31/93	23,800
Skocpol, William 8570-5	High Tc Materials Program (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/92 -- 03/31/93	48,800
Skocpol, William 8568-5	Low Noise Resonator/Oscillator Project (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/92 -- 03/31/93	23,800
Skocpol, William 8570-5	High Tc Materials Program (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/92 -- 09/30/93	20,000
Skocpol, William 8568-5	Low Noise Resonator/Oscillator Project (Subcontract via Massachusetts Institute of Technology)	Department of Defense	04/01/92 -- 09/30/93	23,200
Skocpol, William 8056-5	Proximity - Coupled HTSC Materials and Devices	Department of Defense	08/15/90 -- 10/31/93	110,000
Stone, James 7752-5	Research Accomplishments and Future Goals in Particle Physics/Task C: Macro Project	Department of Energy	06/01/89 -- 05/31/90	78,468
Stone, James 7752-5	Research Accomplishments and Future Goals in Particle Physics/Task C: Macro Project	Department of Energy	06/01/89 -- 05/31/90	85,347
Stone, James 7752-5	Research Accomplishments and Future Goals in Particle Physics/Task C: Macro Project	Department of Energy	06/01/90 -- 10/31/90	126,384

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Department of Physics

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Stone, James 7968-5	Research Accomplishments and Future Goals in Particle Physics/Macro Equipment	Department of Energy	06/01/89 - 05/31/90	205,000
Stone, James 7968-5	Research Accomplishments and Future Goals in Particle Physics/Macro Equipment	Department of Energy	06/01/90 -- 05/31/91	19,200
Stone, James 7968-5	Research Accomplishments and Future Goals in Particle Physics/Macro Equipment	Department of Energy	06/01/90 -- 10/31/90	800
Stone, James 7752-5	Research Accomplishments and Future Goals in Particle Physics/Task C: Macro Project	Department of Energy	06/01/90 -- 05/31/91	173,616
Stone, James 7752-5	Research Accomplishments and Future Goals in Particle Physics/Task C: Macro Project	Department of Energy	06/01/91 -- 10/31/91	160,116
Stone, James 7968-5	Research Accomplishments and Future Goals in Particle Physics/Task C: Macro Equipment	Department of Energy	06/01/91 -- 10/31/91	370,000
Stone, James 0926-6	Second School on Non-Accelerator Particle Astro-physics: Triest, Italy: June 3-14, 1991	National Science Foundation	05/28/91 -- 11/30/91	5,000
Stone, James 7752-5	Research Accomplishments and Future Goals in Particle Physics/Task C: Macro Project	Department of Energy	06/01/91 -- 05/31/92	206,379
Stone, James 8566-5	Research Accomplishments and Future Goals in Particle Physics: Macro Equipment	Department of Energy	06/01/91 -- 08/30/92	100,000

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Stone, James 7968-5	Research Accomplishments and Future Goals in Particle Physics: Macro Equipment	Department of Energy	06/01/91 -- 09/30/92	385,000
Stone, James 8524-5	Research in Particle Physics /Task C: Monopole Neutrino Group	Department of Energy	03/01/92 -- 01/31/93	270,561
Stone, James 8524-5	Research in Particle Physics/Task C: Monopole Neutrino Group	Department of Energy	02/01/93 -- 01/31/94	380,000
Stone, James 8748-5	Research in Particle Physics/Task C: Monopole Neutrino Group	Department of Energy	02/01/93 -- 01/31/94	176,000
Stone, James 8524-5	Research in Particle Physics/Task C: Monopole Neutrino Group	Department of Energy	02/01/94 -- 01/31/95	300,000
Sulak, Lawrence 7753-5	Research Accomplishments and Future Goals in Particle Physics/Task D: Proton Decay	Department of Energy	06/01/89 -- 01/31/90	44,012
Sulak, Lawrence 7753-5	Research Accomplishments and Future Goals in Particle Physics/Task D: Proton Decay	Department of Energy	06/01/89 -- 01/31/90	41,218
Sulak, Lawrence 7753-5	Research Accomplishments and Future Goals in Particle Physics/Task D: Proton Decay	Department of Energy	06/01/90 -- 10/31/90	93,212
Sulak, Lawrence 7755-5	Research Accomplishments and Future Goals in Particle Physics/Task F: Muon G-2	Department of Energy	06/01/89 -- 01/31/90	24,081
Sulak, Lawrence 7755-5	Research Accomplishments and Future Goals in Particle Physics/Task F: Muon G-2	Department of Energy	06/01/89 -- 05/31/90	11,125

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Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Sulak, Lawrence 7755-5	Research Accomplishments and Future Goals in Particle Physics/Task F: Muon G-2	Department of Energy	06/01/90 -- 10/31/90	80,061
Sulak, Lawrence 5693-7	Graduate Assistance in Areas of National Need	Department of Education	01/01/90 --12/31/90	170,280
Sulak, Lawrence 8012-5	Research Accomplishments and Future Goals in Particle Physics/Task K: SSCintCal Project (Equipment)	Department of Energy	02/01/90 -- 10/31/90	83,000
Sulak, Lawrence 8013-5	Research Accomplishments and Future Goals in Particle Physics/Task K: SSCintCal Project	Department of Energy	02/01/90 -- 10/31/90	52,000
Sulak, Lawrence 7753-5	Research Accomplishments and Future Goals in Particle Physics/Task D: Proton Decay	Department of Energy	06/01/90 -- 10/31/90	15,770
Sulak, Lawrence 7753-5	Research Accomplishments and Future Goals in Particle Physics/Task D: Proton Decay	Department of Energy	06/01/90 -- 05/31/91	95,918
Sulak, Lawrence 7755-5	Research Accomplishments and Future Goals in Particle Physics/Task F: Muon G-2	Department of Energy	06/01/90 -- 05/31/91	79,939
Sulak, Lawrence 8171-5	Manufacturing Techniques Evaluation and Cost Estimation of Scintillating Fiber Calorimeter (Subcontract via SUNY/Stony Brook)	Department of Energy	08/01/90 -- 12/31/90	60,000
Sulak, Lawrence 7755-5	Research Accomplishments and Future Goals in Particle Physics/Task F: Muon G-2	Department of Energy	06/01/91 -- 10/31/91	100,647

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Department of Physics

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Sulak, Lawrence 7753-5	Research Accomplishments and Future Goals in Particle Physics/Task D: Proton Decay	Department of Energy	06/01/91 -- 10/31/91	93,531
Sulak, Lawrence 8272-5	The Engineering and Testing of a Fiber Calorimeter Prototype	State of Texas/National Research Laboratory Commission	04/01/91 -- 03/31/92	160,000
Sulak, Lawrence 5710-7	Graduate Assistance in Areas of National Need	Department of Education	01/01/91 -- 12/31/91	170,280
Sulak, Lawrence 8012-5	Research Accomplishments and Future Goals in Particle Physics: SSCintCal Equipment	Department of Energy	06/01/91 -- 10/31/91	93,300
Sulak, Lawrence 8448-5	Stabilization of the IMB Detector (Subcontract via University of California/Irvine)	Department of Energy	03/01/91 -- 01/31/92	13,541
Sulak, Lawrence 7753-5	Research Accomplishments and Future Goals in Particle Physics/Task D: Proton Decay	Department of Energy	06/01/91 -- 05/31/92	112,469
Sulak, Lawrence 7755-5	Research Accomplishments and Future Goals in Particle Physics/Task F: Muon G-2	Department of Energy	06/01/91 -- 05/31/92	99,353
Sulak, Lawrence Whitaker, J. Scott 8529-5	Research in Particle Physics Task L: SSC Detector Development (Operating)	Department of Energy	03/01/92 -- 01/31/93	65,955
Sulak, Lawrence Whitaker, J. Scott 8528-5	Research in Particle Physics Task L: SSC Detector Development (Equipment)	Department of Energy	03/01/92 -- 01/31/93	165,000
Sulak, Lawrence 8674-5	GEM Hadron Calorimeter Baseline II Engineering Project (Subcontract via Universities Research Association, Inc.)	Department of Energy	06/01/92 -- 08/15/92	37,500

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Department of Physics

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Sulak, Lawrence Whitaker, J. Scott 8529-5	Research in Particle Physics/Task L: SSC Detector Development (Operating)	Department of Energy	02/01/93 -- 01/31/94	25,000
Sulak, Lawrence 8674-5	GEM Hadron Calorimeter Baseline II Engineering Project (Subcontract via Universities Research Association, Inc.)	Department of Energy	06/01/92 -- 03/31/93	100,000
Sulak, Lawrence 8832-5	Hadron Calorimetry for the GEM Experiment at the SSC	Texas National Research Laboratory Commission	04/01/93 -- 03/31/94	127,000
Sulak, Lawrence 8674-5	GEM Hadron Calorimeter Baseline II Engineering Project (Subcontract via Universities Research Association, Inc.)	Department of Energy	06/01/92 -- 03/31/93	10,000
Whitaker, J. Scott 7751-5	Research Accomplishments and Future Goals in Particle Physics/Task A: Colliding Beams	Department of Energy	06/01/89 - 01/31/90	49,042
Whitaker, J. Scott 7751-5	Research Accomplishments and Future Goals in Particle Physics/Task A: Colliding Beams	Department of Energy	06/01/89 -- 05/31/90	53,218
Whitaker, J. Scott 7751-5	Research Accomplishments and Future Goals in Particle Physics/ Task A: Colliding Beams	Department of Energy	06/01/90 - 10/31/90	95,336
Whitaker, J. Scott 7757-5	Research Accomplishments and Future Goals in Particle Physics/Task RS: Research Support	Department of Energy	06/01/89 -- 01/31/90	7,559
Whitaker, J. Scott 7757-5	Research Accomplishments and Future Goals in Particle Physics/Task RS: Research Support	Department of Energy	06/01/89 -- 05/31/90	8,561
Whitaker, J. Scott 7757-5	Research Accomplishments and Future Goals in Particle Physics/Task RS: Research Support	Department of Energy	06/01/90 -- 10/31/90	10,575

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Department of Physics

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Whitaker, J. Scott 7935-5	Research Accomplishments and Future Goals in Particle Physics/Colliding Beams Equipment	Department of Energy	03/01/90 - 10/31/90	106,000
Whitaker, J. Scott 8027-5	Research Accomplishments and Future Goals in Particle Physics/Task L: TRD Project (Equipment)	Department of Energy	03/01/90 -- 10/31/90	104,000
Whitaker, J. Scott 8026-5	Research Accomplishments and Future Goals in Particle Physics/Task L: TRD Project	Department of Energy	03/01/90 -- 10/31/90	105,000
Whitaker, J. Scott 7757-5	Research Accomplishments and Future Goals in Particle Physics/Task RS: Research Support	Department of Energy	06/01/90 -- 05/31/91	21,425
Whitaker, J. Scott 7751-5	Research Accomplishments and Future Goals in Particle Physics/TaskA: Colliding Beams	Department of Energy	06/01/90 -- 05/31/91	109,644
Whitaker, J. Scott 7751-5	Research Accomplishments and Future Goals in Particle Physics/Task A: Colliding Beams	Department of Energy	06/01/91 -- 10/31/91	111,884
Whitaker, J. Scott 7757-5	Research Accomplishments and Future Goals in Particle Physics/Task RS: Research Support	Department of Energy	06/01/91 -- 10/31/91	14,129
Whitaker, J. Scott 7935-5	Research Accomplishments and Future Goals in Particle Physics: Colliding Beams Equipment	Department of Energy	06/01/91 -- 10/31/91	59,000
Whitaker, J. Scott 8026-5	Research Accomplishments and Future Goals in Particle Physics/Task L: TRD Project	Department of Energy	06/01/91 -- 10/31/91	20,000

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Department of Physics

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Whitaker, J. Scott 8027-5	Research Accomplishments and Future Goals in Particle Physics TRD Project Equipment	Department of Energy	06/01/91 -- 10/31/91	40,000
Whitaker, J. Scott Ahlen, Steven 8026-5	Research Accomplishments and Future Goals in Particle Physics/Task L: TRD Project	Department of Energy	06/01/91 -- 10/31/91	34,800
Whitaker, J. Scott Ahlen, Steven 8027-5	Research Accomplishments and Future Goals in Particle Physics: TRD Project Equipment	Department of Energy	06/01/91 -- 10/31/91	20,000
Whitaker, J. Scott 7751-5	Research Accomplishments and Future Goals in Particle Physics/Task A: Colliding Beams	Department of Energy	06/01/91 -- 05/31/92	93,116
Whitaker, J. Scott 7757-5	Research Accomplishments and Future Goals in Particle Physics/Task RS: Research Support	Department of Energy	06/01/91 -- 05/31/92	19,871
Whitaker, J. Scott 8434-5	Research Accomplishments and Future Goals in Particle Physics/Task RS: Research Equipment	Department of Energy	01/01/92 -- 05/31/92	104,615
Whitaker, J. Scott 8530-5	Research in Particle Physics Task RS: Research Support	Department of Energy	03/01/92 -- 01/31/93	23,436
Whitaker, J. Scott Wilson, R.J. 8522-5	Research in Particle Physics/Task A: Colliding Beams	Department of Energy	03/01/92 -- 01/31/93	156,287
Whitaker, J. Scott 8669-5	Research in Particle Physics/Task L: SSC Detector Development (Equipment)	Department of Energy	03/01/92 -- 01/31/93	50,000
Whitaker, J Scott 8530-5	Research in Particle Physics/Task RS: Research Support	Department of Energy	02/01/93 -- 01/31/94	40,000

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Department of Physics

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Whitaker, J. Scott Wilson, Robert 8522-5	Research in Particle Physics/Task A: Colliding Beams	Department of Energy	02/01/93 -- 01/31/94	225,000
Whitaker, J. Scott 8621-5	Measurement of Muon Backgrounds and Muon Chamber Performance (Subcontract via The Research Foundation of SUNY/Stony Brook)	Texas National Research Laboratory Commission	06/01/92 -- 05/31/93	10,000
Whitaker, J. Scott 8789-5	Cathode Strip Chambers for the GEM Experiment	Texas National Research Laboratory Commission	04/01/93 -- 03/31/94	184,000
Whitaker, J. Scott 8837-5	Measurements and Stimulations of Muon Backgrounds and Muon Chamber Performing at the SSCL (Subcontract via The Research Foundation of SUNY/Stony Brook)	Texas National Research Laboratory Commission	04/01/93 -- 03/31/94	10,000
Whitaker, J. Scott 8669-5	Research in Particle Physics/Task L: SSC Detector Development (Equipment)	Department of Energy	02/01/93 -- 01/31/94	81,000
Whitaker, J. Scott 8522-5	Research in Particle Physics/Task A: Colliding Beams	Department of Energy	02/01/94 -- 01/31/95	220,000
Whitaker, J. Scott 9007-5	Research in Particle Physics/Task A: Colliding Beams (Equipment)	Department of Energy	02/01/94 -- 01/31/95	110,000
Whitaker, J. Scott 8530-5	Research in Particle Physics/Task RS: Research Support	Department of Energy	02/01/94 -- 01/31/95	45,000
Whitaker, J. Scott 8929-5	Fabrication of Cathode Strip Chambers for GEM	Department of Energy	08/24/93 -- 06/30/94	24,000
Wilson, Robert Whitaker, J. Scott 7935-5	Research Accomplishments and Future Goals in Particle Physics: Colliding Beams Equipment	Department of Energy	06/01/91 -- 09/30/92	41,000

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Department of Physics

Principal Investigator	Title of Project	Granting Agency	Period of Project	Amount
Worstell, William 8075-5	SSC Fellowship Award	State of Texas/National Research Laboratory Commission	07/01/90 -- 06/30/91	92,854
Worstell, William 8527-5	Research in Particle Physics/Task F: Muon G-2 Project	Department of Energy	03/01/92 -- 01/31/93	138,972
Worstell, William 8527-5	Research in Particle Physics/Task F: Muon G-2 Project	Department of Energy	02/01/93 -- 01/31/94	220,000
Worstell, William 8736-5	Research in Particle Physics/Task F: Muon G-2 Project (Equipment)	Department of Energy	02/01/93 -- 01/31/94	10,000
Worstell, William 8527-5	Research in Particle Physics/Task F: Muon G-2 Project	Department of Energy	02/01/94 -- 01/31/95	205,000
Zhou, Bing 8076-5	SSC Fellowship Award	State of Texas/National Research Laboratory Commission	07/01/90 -- 06/30/91	65,909
Zhou, Bing 8887-5	Search for Higgs from LEP to SSC	National Science Foundation	08/15/93 -- 01/31/95	20,000
Zhou, Bing 8887-5	Search for Higgs from LEP to SSC	National Science Foundation	08/15/93 -- 01/31/95	40,000

Attachment 5

"A Proposal to Establish an Institute for Advanced Physics Research"

Boston University
Department of Physics

A Proposal to Establish an

INSTITUTE FOR ADVANCED PHYSICS RESEARCH

comprising the

LABORATORY FOR HIGH ENERGY PARTICLE AND ACCELERATOR RESEARCH
CENTER FOR COMPUTATIONAL SCIENCE
LABORATORY FOR THE DEVELOPMENT OF NOVEL MATERIALS
CENTER FOR ELEMENTARY PARTICLE THEORY
LABORATORY FOR MOLECULAR BIOPHYSICS AND BIOTECHNOLOGY
CENTER FOR POLYMER PHYSICS

Boston University
March 17, 1987

EXECUTIVE SUMMARY

Boston University proposes to establish an Institute of Advanced Physics Research. The Institute will be built upon the excellent interdisciplinary work in physics that is already being done at Boston University, and will focus that work on problems that are of intrinsic scientific interest, of national importance and of importance to the continued growth of the industrial base of the Northeast.

The goal of the Institute is to perform basic research at the frontiers of science in fields closely allied to the emerging technologies that will bolster American scientific competitiveness and enhance the economic development of the region and the nation.

The Institute for Advanced Physics Research will build upon the major investment already made by Boston University in physics research of outstanding quality. In recent years, Boston University has attracted an internationally recognized group of faculty, staff and graduate students in the fields of high energy experimental physics, computational science, elementary particle theory, materials science, molecular biophysics, and polymer physics. Simultaneously, the University has developed the support services—a Scientific Instrument Facility, an Electronics Design Facility, and a Computational Physics Facility--that equal or surpass any in the nation.

Within the past three years, Boston University has added 16 new faculty positions in physics, an additional 10 faculty positions in related departments (chemistry, biology, mathematics, engineering), approximately $6 million in equipment and seed monies for physics, and approximately $15 million in new physics facilities.

The fields of study that will be part of the Institute for Advanced Physics Research will at least double in size over the next ten years. For this growth to take place, however, custom-designed laboratories, equipment assembly space and computer controlled machine shops must be constructed. (These essential facilities are currently housed in cramped temporary space.) In addition, the complex instruments necessary to allow us to compete with the industrialized nations of Western Europe and East Asia must be designed and built: these will include such highly sophisticated devices as equipment for a new X-ray light source beam line and a detector to collect and help interpret the data from the Superconducting Super Collider (SSC).

This proposal addresses both the need for a central laboratory building in which the work of the Institute can be carried out and the scientific instruments that will be housed in the Institute as well as in the various national laboratories that will be used by the researchers.

It should be emphasized that the proposed Institute will tie together talents from traditionally unrelated disciplines. This approach--bringing together accelerator physics and biology, materials science and elementary particle theory, etc.--recognizes the increasing unity of scientific knowledge and the growing need for scientific research in one field to draw upon the methods and insights of related fields. In consequence, the

Institute will provide a model for emulation at other major research centers in the next century. In preparing for the physics of the 1990s and beyond, the Institute will also undertake a major initiative in support of the Superconducting Super Collider.

To help assess the priorities for such an Institute, Boston University will establish a Visiting Committee of distinguished scientists from around the United States and the world. Professor Carlo Rubbia of Harvard University and CERN, winner of the Nobel Prize for Physics in 1985, has agreed to serve as Chairman of the Committee.

The research to be performed at the Institute for Advanced Physics Research will have clear implications for technological and industrial progress throughout the United States, and its location in Boston will make it a major resource for the high-technology and information processing industries of the Northeast.

Both the work of the proposed Institute and its likely impact on American competitiveness are described in the following brief summaries of the current activities of the Laboratories and Centers which the Institute will incorporate.

Laboratory for High Energy Particle and Accelerator Research

The faculty groups in this Laboratory are engaged in the development of advanced instruments that interpret data provided by particle accelerators and storage rings as well as by large non-accelerator experiments.

The practical importance of this work can be seen when we consider that the last generation of such instruments has become an essential part of contemporary medicine. The drift chambers and proportional chambers first designed as detectors in particle accelerators are now the heart of PET scanning. NMR scanners are calibrated by an exact copy of the magnetic field measuring instrument that was used in the first experiment to measure the magnetic spin of the muon. And the equipment for the next major attempt at measuring the magnetic spin of the muon is now being designed and built by members of this Laboratory.

Another faculty group is building a major component of one of the most advanced detectors in the world for use in colliding beam particle experiments. The required maching tolerances are microscopically small—so much so that they are economically feasible only on Boston University's state-of-the-art computer-controlled milling and lathing stations. Machining to these extraordinarily exact tolerances will almost certainly become an essential feature of the next generation of manufacturing processes, both for scientific instruments and for commercial manufacturing. Boston University is now one of the few places in the world where this technology is being demonstrated and refined.

A third faculty group, using the world's largest detector (built in a mine shaft under Lake Erie), has just identified the first neutrinos ever seen on earth that come from an extraterrestrial object. These particles, emitted from the recent supernova explosion, measure the internal temperature of the exploding star as well as the details of the explosion.

All these research groups from the Boston University Laboratory for High Energy Particle and Accelerator Research will come together to collaborate with groups from other centers of research excellence in this field to design, build, test and use a major detector at the Superconducting Supercollider. The experience that they will gain from their current research projects, in addition to their extensive use of the state-of-the-art shops in the proposed Institute, will prepare them to play a major role when the SSC comes on line in the next decade.

Center for Computational Sciences

Members of this Center and their collaborators are the largest users of supercomputer time in the U.S., except for the military. Their goal is to place the power of a supercomputer on the desk of every engineer and scientist in America as soon as possible. To achieve this goal, they will work closely with industry--a collaboration that has already begun. Again, work in this field which first began in the search to solve extremely difficult problems in physics is now being applied to very different fields, including weather forecasting and the understanding of turbulence and other so-called "chaotic" phenomena.

Laboratory for Development of Novel Materials

This Laboratory will use powerful X-ray light sources, ultra-low temperatures and high magnetic fields to study the structure of new man-made materials. The goal is to develop materials which do not appear in nature but which have properties that make them ideally suited to specific applications. An example of such materials are new superconductors which, it now appears, can be made to operate at nearly room temperature. These materials will revolutionize how electrical power is transmitted and the efficiency with which it can be used. In consequence, highly efficient automobiles and transport systems with superconducting motors appear to be quite feasible in the near future.

Center for Elementary Particle Theory

This Center concentrates on the four central issues of modern high energy physics: 1) understanding how particles behave at very high energies—a subject which will be probed in experiments at the SSC; 2) understanding the earliest moments of the physical universe; 3) constructing a "theory of everything"—a unified picture of all the forces and all the particles of nature; and 4) computational physics, which attempts to reduce difficult and complicated problems to a form in which powerful computers can provide a solution.

These endeavors have direct application to many other fields of science. The mathematics and the computational tools developed to address these problems can also be used to solve problems in other disciplines. In addition, the work done in these areas is a training ground for advanced students with the scientific sophistication to solve technological problems of all sorts.

Laboratory for Molecular Biophysics and Biotechnology

This Laboratory is developing the materials required to produce the next generation of super-miniaturized patterns for electronic circuitry. The goal is literally to grow a biological organism that includes in its structure the circuit pattern one is seeking. These organisms are no larger than organic molecules, so these devices could contain a million circuits in an area of about the same size as a current electronic chip.

This Laboratory also seeks to determine how tiny biomolecular systems work. A major breakthrough was recently achieved when scientists in the Laboratory were able to describe how the molecules in the eye convert a tiny unit of light into an impulse to the brain. This biological "machine" is far more efficient than equivalent man-made devices, and the ultimate goal of this research is to replicate this efficiency in man-made devices.

Center for Polymer Physics

Polymers are extremely complicated chains of molecules. The theorists in the Polymer Center use modern computational techniques to understand these highly elaborate substances, as well as chaotic natural phenomena. They have recently been able to simulate the growth of snowflakes so that the results are indistinguishable from nature's originals. These same techniques help us to understand how silicon behaves when it is being refined, and this in turn makes it possible to grow more perfect crystals for the semiconductor industry. The same mathematical techniques also describe how oil or water percolates through porous material, which allows for more efficient oil wells and water use. The members of the Center have strong links with petroleum-based industries, and are also involved with the engineering of new materials based on polymers.

Conclusion

The Institute for Advanced Physics Research will be a center for imaginative, rigorous investigations into some of the most fundamental problems of nature. It will also be a resource that America's traditional and emerging industries can draw upon for the new ideas and new technologies that they will need to remain competitive in world markets. The issues upon which the Institute will focus--new and more powerful techniques of computation, new materials made of polymers and other organic substances, micro-miniaturization and manufacturing to micrometric tolerances, electrical superconductivity and the application of extremely high magnetic fields--are of particular importance for the industrial base of Massachusetts and the Northeast. The Institute will also be a major provider of our most important natural resource--human capital: the trained intelligence without which no scientific or economic progress is possible. And by no means of least importance for the American spirit, the Institute will provide a new focus for the great intellectual adventure of trying to unravel more of the mysteries of the physical universe--a quest that has been and will remain America's real frontier.

Laboratory for High Energy Physics and Accelerator Research

The success of the SSC program will hinge on having in place the people and the instruments required to carry out the experimental exploration of the high energy frontier. Boston University physicists are making a two-pronged contribution to this effort.

1) We have a computer-controlled scientific instrument shop, an electronics design shop, and computing facilities that are among the most advanced to be found in any university in the country. These are essential to the design and construction of the detectors that will gather the data produced by the SSC.

2) We also have a growing body of graduate students, postdoctoral physicists, and faculty members who are trained in the modern technology that will collect the experimental data and who are experienced in the analytic techniques needed to turn raw data into physics results.

Experimental apparatus in a collider facility such as the SSC is intimately tied in to the accelerator itself. The magnetic fields and the vacuum system of the detector constitute an extension of the beam lines of the accelerator; their integration into the main systems is crucial to the proper operation of the complete facility. At Boston University, under the aegis of Dr. F. Krienen (formerly the chief engineer for CERN, the European Center for High Energy Physics), we are pursuing research in advanced accelerator technology including electrostatic and magnetic beam steering components, magnetic field measurement with ultrahigh precision, and vacuum chamber design.

This research group is responsible in large part for the design of a new precision superconducting storage ring now being built at Brookhaven National Laboratory. This ultramodern facility will be used for the measurement of the anomalous spin of the muon, the heavy sister of the electron, to a degree of precision twenty times better than at present. This fundamental physical quantity is important for the understanding of possible high-mass fundamental particles, and the results of this measurement may well presage the physics to be studied at the SSC. A large number of undergraduate and graduate students is being trained in this design effort, gathering experience in the calculational methods and engineering principles that are central to accelerator physics.

In contemporary high energy physics experiments, particle collisions occur at a very high rate. At the SSC, a collision occurs every hundred-millionth of a second, on the average. These collisions produce a large number of outgoing particles which must be tracked and identified. Collisions in the SSC will produce hundreds of charged particles and photons. Detectors must provide the detailed information that is required for study of these interactions, and the detector systems must cope with data acquisition rates at the level of hundreds of millions of characters per second. Construction of these detectors and processor needed to handle all the data produced will extend the limits not only of detector technology but also of the electronic and computational techniques used to collect and process this information. Top-quality facilities are the key to effective contribution in this effort; we already have most of them at Boston University, but lack the building needed to house these facilities.

Boston University physicists are currently participating in some of the leading experiments in high energy physics and in astrophysics. We list a few of the projects here:

A group led by Dr. L. Sulak (formerly of the University of Michigan and Harvard) is developing the detectors and the electronics for the high rate, high precision needs of the precision superconducting storage ring at Brookhaven. He is also a principal investigator and builder of the electronics and data acquisition for the experiment which has just discovered the neutrinos from the recent supernova, thereby ushering in the age of neutrino astronomy.

Dr. S. Whitaker (who came to Boston University from MIT) and his colleagues are using the Boston University Scientific Instrument Facility to produce precision components for the drift chambers and calorimeters for an experiment to be performed at the SLC accelerator at the Stanford Linear Accelerator Center. Their experiment will study the electroweak interactions of the Z^0 boson, the heaviest particle presently known. The detector is one of the two most advanced colliding beam detectors in the world, and the high precision components being constructed at Boston cannot be economically made elsewhere.

Dr. S. Ahlen (formerly of Indiana University and Berkeley) is fabricating in our shops the detector components for an astrophysics experiment which will search for evidence of antimatter in the cosmic rays which impinge upon the earth from the farthest reaches of the galaxy.

Dr. J. Stone (previously from the University of Michigan and CERN) is leading a group which is sharing responsibility with Cal Tech for an experiment which will search for magnetic monopoles, high energy phenomena in cosmic rays, and neutrinos from supernova.

In each of these efforts, the modern electronic and mechanical facilities of the Boston University shops enable these researchers to create experimental apparatus which is at the leading edge of detector technology, and students and staff associated with these projects are amassing invaluable experience in the techniques of physics research experience which will translate directly into effective scientific use of the SSC.

Center for Computational Science

The extremely powerful computers which have recently become available have opened up whole new areas of study. It is possible today to simulate by computer the dynamical behavior of highly complex systems and to discover properties that could not be revealed by traditional methods of analysis. Investigations that rely on the power of the computer in a fundamental fashion have come to form a novel discipline of research – computational science. Physics research is now divided into three major methodologies: theoretical, experimental, and computational. Computational science is interdisciplinary by its very nature: the computational methods which, for example, simulate the replication and differentiation of large molecular chains in biophysics can be used equally well to investigate the low temperature behavior of spin glasses, the recognition of patterns by the brain, and the new theories of the strong interactions (which hold protons together in the nucleus) and the unified theories of all the particles and forces of nature.

Computational science has become an inescapable mode of investigation for a large part of recent research; its role will become even more prominent in the future. It requires formidable computational tools: supercomputers capable of performing billions of operations per second and keeping millions of numbers in memory. Recognizing the necessity of advanced computation for forefront research and the fact that the corresponding resources cannot be obtained or utilized optimally by individual departments, an interdepartmental Center for Computational Physics is being established at Boston University.

Dr. Claudio Rebbi, one of the leading inventors of techniques in this new field, is the Director of this center. He comes from Brookhaven National Laboratory and has strong ties with the existing Supercomputer Centers set up by the NSF as well as with American supercomputer manufacturers. His large team of collaborators at Boston includes theorists in materials science, computer science, chemistry and engineering. Their immediate goal is to put the power of a supercomputer on the desk of every engineer and scientist in the country as soon as possible. This proposal includes the development of a new supercomputer, in which Prof. Rebbi and his colleagues will collaborate with a major manufacturer to create a machine of extraordinary speed and power. In addition to its importance for basic and applied research, this new supercomputer will help maintain and solidify America's competitive edge in supercomputer technology.

The Center would be housed in the new research building proposed here. It would have resources sufficient to coordinate and advance the overall computational research effort, to make new faculty and research appointments in disciplines related to computation and to acquire new, powerful, state of the art computers in collaboration with industry and other universities. The Boston University Center for Computational Science will play an important role in the expanding forefront research activity in the United States. Applications will be directly transferable to the information industry in this country.

Laboratory for Development of Novel Materials

The Structure of Man-made Materials

The major areas of research activities in this Laboratory are two-fold. The first is "structural solid state physics". Dr. P. Horn, whose work is in this area, is currently being recruited from IBM to be the Director of this effort. It involves the structure of the various phases of matter and includes studies of solids, liquids, liquid crystals, quasicrystals and surfaces. Research in this area is closely related to three of the strengths of the physics department: surface science, theoretical statistical mechanics, and structural biology. This last field (carried out in the Laboratory of Molecular Biophysics and Biotechnology) overlaps present and planned strengths in Chemistry, most notably in the areas of liquid dynamics and structural chemistry.

The experimental center piece of this activity is the proposed University X-ray synchrotron beam line, which would serve as a central facility for structural studies by faculty in Physics, Biology, and Chemistry. This would make Boston University one of the best universities in the world for research on the microscopic nature of matter.

Next Generation in Microcircuits

The second area of expertise is in the field of "solid state electronics". This couples together research groups of the Department which involve low temperature physics, surface science, and solid state theory, as well as the work in molecular and biological engineering. Growth in this area overlaps existing programs in Chemistry and Engineering and complements programs of different focus at MIT and at the National Magnet Laboratory, thus making the Northeast a center of research strength in just the fields of anticipated new growth for the local industry. This area also has a structural component and therefore is symbiotic with the first.

The main intellectual focus of this second area is "mesoscopic phenomena", a generic name for quantum transport and quantum coherence phenomena in ultra small structures. These phenomena are most clearly observable at low temperatures and in high magnetic fields. Low temperature physics (Dr. J. Brooks and Dr. G. Zimmerman) is an essential part of the program. The general approach uses, among other things, recent advances in molecular lithography (Dr. K. Rothschild) together with modern surface science techniques (Dr. M. El Batanouny and Dr. V. Murgai, with theoretical support from Dr. C. Willis) to make small electronic structures and devices.

Ideally the devices under development could display novel quantum properties and be tailored to probe specific quantum physics problems. The proposed equipment would complement the more traditional capabilities in the microstructure fabrication laboratory at MIT in that it would have a uniquely bio-chemical flavor. The use of molecular lithography would naturally give the program a strong opto-electronics character and make it highly attractive for industrial support and collaboration.

Condensed Matter Theory

Successful condensed matter physics programs involve intimate day-to-day interaction of experimentalists and theorists. As a part of the department expansion, Dr. C. Henley was recently appointed as a new condensed matter theorist. Henley has since been awarded both a Sloan Fellowship and an NSF Presidential Young Investigator Award. Indeed, the match of the experimental thrusts and Henley's theoretical programs on the structure of matter is nearly perfect. The plan for condensed matter theory growth advocates future appointments in the area of quantum transport and solid state electronics. Again, the new building of the Institute is essential to the expansion of this program.

Many of the issues of greatest interest in condensed matter physics involve application of quantum mechanics and knowledge of real materials (that is, the individual properties of the different elements). The experimental programs of Murgai, El Batanouny and Brooks are directly related to these areas of condensed matter theory. Topics of great current activity would be addressed by new faculty in this area: (1) "quantum transport theory", which deals with conductivity when quantum interference between different possible electron trajectories is important. This occurs in semiconductor devices at nanometer scales ("mesoscopic phenomena"), (2) heavy fermion materials, where the electrical current is carried by particles that appear hundreds of times more massive than ordinary electrons and which have novel superconducting properties, (3) weak and strong localization (metal-insulator transitions) in disordered materials, and (4) high transition-temperature superconductivity.

Following the announcement last month of new materials with record-breaking (high) superconducting temperatures, this last area is experiencing an enormous burst of activity. Significant applications are projected for power transmission, magnets, superconducting motors, etc.

The expansion proposed has direct application to materials physics and many aspects of low-temperature physics that involve quantum mechanics in an essential way. The largest fraction of research in solid state physics, and most materials science research, is oriented toward such properties. The broadening of the theory group that will be possible with the new building substantially increases interaction with the entire national condensed-matter community, not merely with the specific fields represented by our experimental thrusts.

The Center for Elementary Particle Theory

Progress in physics comes through a continuous interplay among experimental discoveries, their theoretical explanation, and predictions based on new theories. Unexpected measurements or new phenomena require revision or extension of existing theories. New ideas lead to predictions of previously undiscovered phenomena, thus helping to guide the experimental program. The strong effort in physical theory at Boston University is essential to the overall success of any physics initiative, and to the particle experiments and the Superconducting Supercollider program in particular.

Over the past decade or so a consistent theoretical model has emerged which explains much of what we see happening in accelerator experiments. Indeed the recent discovery of the W and Z particles at CERN (the European Center for High Energy Physics) was predicted years earlier on theoretical grounds; without this guidance the discovery would have been far more difficult. As experiments become technologically more sophisticated, however, they focus our attention more clearly on the limitations of the standard model of fundamental particles. Despite its impressive success in unifying a vast body of knowledge about our world into a coherent framework, the standard model leaves fundamental questions unanswered. The most exciting work in high energy physics goes into finding a deeper and more complete successor to the the present theory.This, in turn, requires finding out why quarks have the specific masses and other properties that we measure. What are the most telling experiments one could perform to find the answers to these questions. These are the very problems being investigated asked by the theorists at Boston University. Among these theorists are leaders recently recruited from the best institutions: A. DeRújula from CERN, C. Rebbi from Brookhaven, L. Alvarez-Gaume and P. Nelson from Harvard. The Superconducting Supercollider is designed to answer their questions. They will point the way to the optimum detector for the experimentalists at Boston University and other institutions to build.

High-energy theory has applications extending beyond the traditional accelerator laboratories as well. At the time of the Big Bang the entire universe was dominated by conditions far beyond the reach of any accelerator we can conceive. A detailed theoretical understanding of fundamental particles is crucial to explain the structure of the cosmos, its voids and clusters of matter. Conversely the study of cosmology may one day yield insights into fundamental physics which no laboratory experiment could reveal. Two of our faculty, Drs. So Young Pi and Ken Brecher are at the forefront of this field.

Here on earth, techniques first invented in the service of exotic theories also find their way into very practical applications. The theory of fields now provides tools for the study of phase transitions in materials, including the famous transition to the superconducting state. The theory of scaling, first pursued for the study of the strong nuclear forces, now enters into many-body quantum materials systems and even the field of chaos. Going back still further, quantum mechanics itself (first invented to explain atomic physics) is indispensable for understanding almost any aspect of solid state and condensed matter physics. These new theories have a direct impact on the electronic devices of the future.

Theoretical physics matters. Theorists form an integral part of the educational mission of every physics department, training the next generation of scientists and engineers in subjects of value today. They help shape and interpret the experimental agenda of physics, forge links with sister branches of science, and lay the groundwork for tomorrow's advances. At Boston University, 3,000 students each year gain a knowledge of the basics of our technological society by taking one of our courses.

The research building to be built in this proposal, and the computational equipment associated with it, are indispensible to our mission of supporting forefront high energy particle experiments and in training the technical manpower necessary for maintaining New England's economic base and for the full development of America's human capital.

Laboratory for Molecular Biophysics and Biotechnology

Constructing tailor-made biological materials and machines – the goal of biotechnology – depends on developing new methods to probe the structure and to elucidate the operation of biomolecules and their assemblies. Almost always the tools are developed as spin-offs from basic research in physics. Synchroton light sources, which have recently revealed the structure of viruses, are a typical example. Just 10 years ago, the light emitted from electron storage rings was considered a nuisance by particle physicists. Now we have maximized the X-ray light to produce a source of unparalleled brilliance, a million times more powerful than old style X-ray tubes. The award of last year's Nobel Prize in Physics for the electron microscope (which has had in the past a tremendous impact on biology) and for the recent invention of the scanning tunneling microscope (which holds tremendous potential for studying biological processes) illustrates the synergism of biology, physics, and accelerator physics.

Physicists at Boston University, in collaboration with their colleagues in chemistry here have developed an infrastructure that will support state-of-the-art work in advanced biophysical techniques. The close interplay between condensed matter physics, materials science and biophysical sciences is an important feature of this Laboratory. Major progress has already been made in the key areas of molecular structure elucidation as well as in the utilization of biomolecules for the development of new biomaterials. Future progress depends on constructing new state-of-the-art facilities to house the scanning tunneling microscope and X-ray facilities that will allow us to expand this research and help bring it to the marketplace. It also requires constructing a new synchroton beam in our Scientific Instrument Facility for the National Synchroton Light Source at Brookhaven National Laboratory.

Probing the Operation of Biomolecules

Every biological molecule is an exquisitely designed machine carrying out functions not achievable by even the most sophisticated man-made device. One example studied in detail in our Laboratory is the visual receptor molecule (rhodopsin) is the eye. It detects light with such high efficiency that a single quantum of light can be visually sensed.

Recently, Dr. Ken Rothschild, Director of our Laboratory, has developed a new spectroscopic method to determine the sequence of molecular reactions occurring in biological molecules. This technique, based on infrared spectroscopy, allows us to measure the vibrations of small molecular groups buried inside the rhodopsin molecule that are changing in response to light absorption. This method will be extended in the Institute to study a variety of biological processes, including electrical conduction by nerves and the interaction between a hormone and its receptor.

Probes of Biomolecular Structure

X-ray crystallography is one of the most important methods of determining the st ructure of biomolecules. X-rays are scattered from crystalline arrangements of biological molecules. The resulting pattern is used to reconstruct a detailed three-dimensional model of the molecule. However, often it is impossible to make a crystal of important biological molecules without destroying it.This is especially true when the molecules are part of a more complex structure, such as a biomembrane, the key element in cell walls, etc. The structure of components in important biological systems, such as nerves and hormone receptors, remains unknown for this reason.

Dr. Lee Makowski, who has recently joined this Laboratory from Columbia, has developed a method to analyze X-ray scattering information from non-crystalline biological systems. With his novel technique, he has produced models of the structure of the key electrical connections between cells (gap junctions). The new facilities proposed here would allow study of the structure of sickle cell hemoglobin fibers and the molecular components of blood clots, as well as a number of additional complex biological systems such as viruses. Dr. Makowski would set up in the proposed Institute a unique X-ray scattering facility to analyze biomolecular structure. This work would be in close cooperation with industrial physicists at places like General Electric, and will make vital use of the Boston University light source beam line at Brook haven.

Nanometer Lithography-Biomembranes as Masks for Electronic Circuitry

Current fabricating techniques produce integrated circuit electronic and optical devices which are one millionth of a meter in size. The next technological leap, which would have dramatic consequences in diverse fields, is the development of methods to fabricate electro/optical components the size of biological molecules (one billionth of a meter, a *nanometer*). Circuits could have a millionfold increase in density. Biological molecules might themselves would be engineered for such components. Most scientist agree that this would require dramatic breakthroughs in several interdisciplinary areas. The lack of methods to achieve such a reduction in size is one reason why Nobel Physicist Richard Feynman has summarized the challenge of creating molecular devices with the observation that "there is plenty of room at the bottom".

A major breakthrough on the way to this ultimate goal has recently been achieved at Boston University. Dr. Rothschild (in collaboration with Drs. N. Clark and K. Douglas at the University of Colorado) has shown that biological membranes can be used as masks to produce nanometer size electronic structures. The age of nanometer molecular lithography is almost here. While this process is still crude relative to the refined state of the mature industrial integrated circuit techniques, continued development should provide important new capabilities to the American electronic and computer industry.

For example, the production of periodic nanostructures will provide opportunities for electronic engineers to produce hybrid materials which are tailored on a nanometer level. The combination of functional biological materials and solid-state materials is also anticipated. The concurrence here at Boston University of centers of excellence in both materials science and in biophysics optimizes the probability of producing useful devices with a short lead time for the U.S. chip industry.

The nanometer molecular lithography facility proposed here would be the first such facility in the world with a functioning capability to produce nanometer structures by using self-assembled biological membranes. The close collaboration of both biophysicists and material scientists provides the environment necessary to sustain progress in this field.

In support of the proposed center for molecular biophysics and biotechnology, Boston University is committed to maintain a leadership role by providing state-of-the-art facilities and recruiting the highest caliber scientists in these fields. The recent recruitment of Dr. Makowski, considered one of the leading scientist in structural biophysics, illustrates this commitment. Dr. Mark Braiman, winner of the prestigious Lucille P. Markey Fellowship, also works in the area of biophysics and molecular spectroscopy. The expansion of this Laboratory has been matched by recruitment of high quality graduate students.

Center for Polymer Physics

Polymers are long molecules. They are made up of smaller molecules held together by a combination of physical and chemical forces. The properties of a polymer depend on the ingredients of the recipe, and also on the detailed procedures used to link together the small molecules. Since there is an almost endless number of fashions in which small molecules can be linked to form large networks, the number of polymeric materials is immense.

The range of possible materials that can be forged using existing polymer technologies is staggering. Polymer materials are used for a multitude of purposes, ranging from medical implant devices (such as artificial organs) to defense equipment (such as missile nose cones). Each year the fraction of new materials that are made of polymers increases, and by the year 2000 polymer materials will have replaced non-polymer materials in virtually every aspect of life, including such things as automobile manufacture, housing, and medical equipment.

Since the properties of polymeric materials are known in a statistical sense, statistical mechanics is the science underlying polymer physics. A first rate theory group in statistical physicists (Drs. W. Klein, S. Redner, E. Stanley), associated with the Center for Polymer Physics, enjoys a high reputation. They represent the aspect of the theoretical condensed matter community involved in fractals, chaos, etc. Statistical physics generally with effects that can be seen near critical points, i.e. experimentalists carefully adjust temperature or other parameters to see the statistical effects near phase transitions.

In the past few years, industry in the Far East has attained world leadership in many areas of polymer design and manufacture. One reason for this is that the research efforts in polymer physics have been prodigious, while those in the US have not. This situation is untenable for the national defense, since polymer materials are essential to virtually every device used in national defense, as well as for American industry.

It is generally agreed that our Center is preeminent in the US. It has recently received verbal agreement for two new major research grants, totalling $1M between them. Previously, over $8M in external funding has come to the Center at an annual rate that is now about $0.6M per year. The Center attracts leading workers from all over the world, and the list of visitors reads like a veritable *Who's Who of Polymer Physics*. The Center sponsored a NATO Advanced Study Institute on Polymer Physics in 1985, and hosted the triennial meeting on statistical mechanics (sponsored by the International Union of Pure and Applied Physics) in 1986.

The National Academy of Sciences has just chosen polymer physics for one of the three areas of science that will be advocated to President Reagan as an area that requires urgent infusion of research and development funding. A sum of $100M is being sought to establish technology centers at which universities and industries will cooperate in developing new polymer materials. Dr. E. Stanley, Director of the Center for Polymer Physics is the chairperson of this subgroup of the Academy.

To encourage the natural cross fertilization of these faculty with similar interests, the proposed Institute would house the Center for Polymer Physics along side the theorists associated with the Laboratory for Development of Novel Materials.

Proposed Budget

INSTITUTE FOR ADVANCED PHYSICS RESEARCH

(in millions)

RESEARCH LABORATORY BUILDING

- 60,000 sq. ft.
- 15 Custom Designed Laboratories (@ 1200 square feet each)
- 43 Faculty, Postdoctoral Fellow and Graduate Student Offices
- High Bay Assembly Area for High Energy Physics (approx. 4,000 square feet)
- Computer Controlled Precision Instrument Shop (approximately 8,000 square feet) $9.0M

SCIENTIFIC FURNISHINGS FOR RESEARCH BUILDING 1.5

$10.5M

LABORATORY FOR MOLECULAR BIOPHYSICS AND BIOTECHNOLOGY - EQUIPMENT

Membrane Protein Crystalization System	0.2
X-ray structure facility	
X-ray generators (3) and array detector	0.8
Molecular Graphics Modeling System	0.3
Biotechnology Facility	
Biomolecular Isolation and Purification System	0.2
Nanometer Molecular Lithograph Facility	
Cell Growth System	0.2
Ultrahigh Vacuum, Freeze-Etching System	0.2
Sputtering and Ion etching System	0.3
Scanning Transmission Electron Microscope	0.4
Biomembrane Isolation System	0.2
Biomolecular Spectroscopy Facility	
Kinetic Raman System	0.3
Fourier Transform Raman Spectroscope	0.2
Pulsed Laser System	0.2
Continuous Tuneable Laser System	0.2
Kinetic UV-Visible Nanosecond Spectrometer	0.2
	$3.9M

LABORATORY FOR DEVELOPMENT OF NOVEL MATERIALS-EQUIPMENT

Nanostructure Measurement Facility	
Molecular Beam Epitaxy (MBE) for Semiconductors	1.0
MBE Machine for Metals	1.0
Instrumentation for Surface Analysis and Characterization	0.5
Synchrotron Light/Structures of Matter Facility	
Shared Beams Line (Boston University and Industrial and University Collaborators) at National Synchrotron Light Source	0.8
Pulsed Magnetic Field Facility for Superconducting Materials Study	
Capacitor Bank, Coil Fabrication and Instrumentation	1.0
Low Temperature Superconductivity Facility	

Top-loading dilution refrigerators (2) for studies at near absolute zero	0.4
Helium Liquifaction System and Liquid Nitrogen Distribution Facility 0.4	
High Field Superconducting Magnet System	0.2
Bulk Material and Thin Films Fabrication Facility	
Ovens, Glove Boxes, Etc.	0.3
High Vacuum Thin Film Deposition Equipment	0.3
	$5.9M

LABORATORY FOR HIGH ENERGY PHYSICS AND ACCELERATOR RESEARCH and CENTER FOR ELEMENTARY PARTICLE THEORY - EQUIPMENT

High Energy Physics Network, Laser Printers, Terminal Servers	0.2
VAX 8550 CPU	0.4
Advanced Graphics	0.2
VAX Workstations (1/lab)	0.2
VAX Parallel Processors for Monte Carlo and Date Playback (=Several Cybers)	0.2
	$1.2M

CENTER FOR COMPUTATIONAL SCIENCE - EQUIPMENT

Supercomputer (University share of collaboration with industry)	3.0
Periphrials	1.2
Software	0.8
Workstations and Minor Equipment	0.4
	$5.4M
Proposal Total	$26.9M

Attachment 6

Proposal for Center for Photonics Research

Center for Photonics Research
at
Boston University

submitted to the
Office of the Director of Defense Research and Engineering
Department of Defense
Washington, DC 20301-3030

by
Trustees of Boston University
881 Commonwealth Avenue
Boston, MA 02215

Funding requested:		$29,000,000
Duration of Effort:	01 June 1993	- 31 May 1996

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John R. Silber, President, Boston University March 10, 1993

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Center for Photonics Research
at
Boston University

Abstract

An interdisciplinary Center for Photonics Research will be established at Boston University to address Department of Defense needs through research and development associated with the expanding field of photonics. A new facility will be created to house three separate programs: (1) Photonic Materials, (2) Photonic Devices & Systems, and (3) Photonics Communications, Management, and Training. Six laboratories for the study of Wide Band-gap Semiconductors, Biomolecular Materials, Environmental Sensing and Photocatalysis, High-Capacity Supercomputer Networks, Ultrafast Spectroscopy, and Systems Integration will be established. Existing Industry collaborations will be expanded through a consortium initiated to serve as a resource for both defense and civilian photonics activities.

Four *Core Problems* form the initial technical focus for the Center: fabrication of novel photonic devices that employ wide band-gap semiconductor materials for emission and detection at blue or ultraviolet wavelengths; development of spectroscopic techniques for ultra-sensitive detection of pollutants or chemical warfare agents and photocatalytic materials for pollution remediation and detoxification; development of photonic biomolecular materials with unique properties for chemical sensing; and design of ultra-high-capacity supercomputer networking and storage technology. The Program for Communications, Management, and Training will disseminate information on photonics development and facilitate technology transfer and collaborative efforts with industry. It will also provide the basis for the training of graduate and undergraduate students in photonics.

A rapidly growing research program, expanding technical capabilities, and new University cost-sharing will leverage the investment of DoD in the development of a continuing resource for addressing the nation's defense and civilian needs for advances in photonics technology.

Center for Photonics Research

1.0 Technical Information

The maintenance of a prepared and effective military in a time of fiscal constraint and rapid technological evolution is the central challenge for America's defense systems during the 1990s. Responding to this challenge will require technical and institutional innovations. A recurrent technical theme of central importance to the DoD is the development of photonic devices and systems, technologies for which the photon is the basis for information transfer and storage, sensing, and detection.

Boston University is proposing the establishment of a Center for Photonics Research that will contribute new scientific knowledge and technological development to the field of photonics, especially with regard to certain core problems of recognized importance to defense missions. As an intellectual and facilities resource, the Center will also encourage the long-term development of private-sector competitiveness. Effective mobilization of government, academia, and industry for photonics research and for the development of related new products will require substantial investment. Boston University is prepared to contribute significant resources to the establishment of the Center. The University has received an enthusiastic response from local industry for the creation of an intellectual focus and an infrastructure for photonics development in Boston.

Our mission statement is:

- *to conduct basic and applied research on photonic materials, devices, and systems related to defense needs;*
- *to establish research laboratories and facilities to support collaboration among academia, industry and DoD in a consortium of efforts in photonics for the New England area;*
- *to promote technological advances and commercialization in photonics;*
- *to support measures for the transfer of technology to DoD and industry;*
- *to prepare students for professional careers in photonics;*
- *to promote economic development associated with a strong photonics industry.*

Support by the Department of Defense of the proposed programs of the Center for Photonics, along with the University's major cost-sharing contribution, will forge a partnership for the development of photonics technology for both military and civilian applications. The Center will provide an important complement to the regional strength of Boston and New England in high technology and military research and development. The effort will further provide a continuing resource for the reorientation of technical defense personnel toward economic development goals. It is expected that, after an initial infusion of resources, the university-industry collaboration in photonics will be sustained through funding from federal or foundation sources, and through corporate investment in research and development at the Center.

Subsequent sections of the present proposal will show the relevance of the Center's activities to the technical objectives and missions of the Department of Defense, describe the organization of the Center, and provide details about the scientific and technical efforts to be conducted. A budget and supporting materials on faculty, facilities, ongoing research, and corporate interest in the Center will complete the proposal. Sections 1.1 and 1.2, and the associated figures that graphically depict research and organizational strategies for reaching specific near-term objectives, constitute *an executive summary* of the proposal.

1.1 Potential Benefit to Defense Missions

In the FY 1992 National Defense Appropriations Act, Congress provided $29 million for the establishment of a photonics center at Boston University. This section discusses the general importance of photonics research to the defense mission, and the particular benefits of establishing the Center for Photonics Research at Boston University.

1.1.1 Photonics in the 1992 Defense Technology Plan

Photonics will be critical to successful defense missions, as budget constraints and the changing geopolitical scene demand more efficient and effective fighting forces. Air, sea, land, and space platforms and systems will need faster, lighter and more effective communications, faster computer processing, and novel sensing, recognition, and engagement capabilities. The well-documented potential contributions of photonics were illustrated in the seven major priority areas of the DoD July 1992 Defense Technology Plan. Major challenges in photonics research were associated with the key technological areas involving computers, sensors, electronic devices, environmental effects, and materials and processes. Many specific defense problems are tightly coupled across key technological sectors, so that photonics research pursued simultaneously on several fronts will have maximum impact. For example, improved optoelectronic integrated circuits (OEICs) will support faster optical communications. Advances in photonics will also foster communications over new high-capacity networks and between databases. The potential for breakthroughs is so great in such a setting that calls for Institutional structures that facilitate collaborative interactions must be a high funding priority. The 1992 Defense Technology Plan recognizes the strength and efficiency of collaborative research including the establishment of centers of excellence related to photonics. A strong domestic photonics industry serves both defense and civilian applications. Besides strengthening our national competitiveness, civilian photonics activity creates the resources for serving future DoD requirements.

The Photonics Center will be most responsive to critical DoD needs, if it can foster advances in selected technical areas, or address specific *Core Problems* within a collaborative research environment.

1.1.2 Core Problem 1: Wide Band-gap Semiconductor Materials

The first core problem is identified with the development, characterization and application of *wide band-gap semiconductors.* These materials are characterized by band-gap structures of about 2 eV and higher, resulting in wavelengths from the blue-green to the UV regions. Fabricated on novel substrates like III-V semiconductors, wide band-gap materials offer not only spectral flexibility, but compatibility with higher speed electronics based on GaAs rather than Si. Large band-gap lasers and laser materials can provide many technical benefits, from higher density optical data storage to greater penetration of water for communications or search and track functions like shallow water mine detection. Lasers and LEDs in the blue-green could provide pumping energy for other novel sources and optical amplifiers as well. Space - to - space communications also would benefit from emitters and detectors in the 240-280 nm wavelength range. Since the Earth's atmosphere is opaque to these wavelengths, such communication is secure from surveillance from the Earth.

Blue light sources will be critical to improved color displays, especially flat panel displays and the color megapixel displays needed for fast synthetic reality displays that promise to play an important role in mission training and battlefield simulations. Integrated with other tunable sources, wide band-gap sources open new areas for wavelength division multiplexing of high speed communications, increasing greatly the channel bandwidths over optical interconnects and fiber communications systems. Wide band-gap semiconductor research will involve collaborations primarily among electrical engineers and physicists, and would be supported by theoretical studies of deposition processes and simulation studies of novel devices. External collaborations are expected to strengthen industrial activities in fundamental materials and devices, as well as in systems applications of these novel materials.

1.1.3 Core Problem 2: Biomolecular Materials

The second core problem addresses the development and characterization of *biomolecular materials* in photonics applications. A particular focus will be the development of new materials for detection of chemical warfare agents, a key DoD mission goal.

In the last decade, considerable interest has been directed toward the development of biomolecular materials, materials containing native biomolecules such as proteins and nucleic acids or derivatives thereof. It is known that some of these biomolecules exhibit potentially useful properties including selective response to biologically active chemicals and biomolecules such as neurotoxins, optoelectronic behavior, signal-transduction and self-assembly. Benefits to the DoD's mission would accrue if these properties could be utilized to produce novel materials for sensing of chemical or biological warfare agents. Other new photophysical properties of biomolecular materials might be exploited for optical information storage and processing, or for the application of dynamic spectral changes for camouflage or eye protection. At a time when circuit fabrication processes using conventional solid-state, chemical and optical methods are reaching fundamental scale limits, the promise of molecular level manipulation using biological methods is extremely attractive. Recent progress in molecular biology now opens the possibility of incorporating non-biological components into proteins, thus tailoring their properties for incorporation into new materials. This research would primarily involve biophysicists, molecular biologists, chemists and bioengineers in its initial efforts. As novel materials are produced, interactions with systems engineers would grow. Industrial collaborations would occur with materials and biotechnology companies.

1.1.4 Core Problem 3: Environmental Sensing and Photocatalysis

The third core problem seeks scientific understanding of how advanced optics and spectroscopies can be applied to develop improved environmental sensing and detection, and how novel photocatalytic processes can be used to mitigate environmental hazards.

A growing DoD challenge is the control and disposal of hazards associated with both battlefield maneuvers and with peacetime operations and procurement. Of particular urgency is the assessment of the effectiveness of storage of chemical or biological warfare agents. We seek to provide new methodology for the sensing of chemical agents through photonic devices that are ultra-sensitive to chemical structure and provide a means for rapid-response analysis. The need for *disposal* of chemical and other weaponry represents another application of photonics. Addressed in the proposal is the pursuit of mechanisms for the destruction of pollutants using new materials for surface photocatalysis. The dangers associated with stored or leaking fuels, and oil spills represent just a few problems that may yield to photocatalytic methods, where the use of conventional light sources can detoxify a potentially hazardous materials site. In the Environmental Sensing and Photocatalysis program, methods will be developed to address DoD's needs for remote sensing, and the mitigation of hazards through photonics methodology.

1.1.5 Core Problem 4: Photonics Links among Supercomputers

In the fourth core problem area, we plan to use photonics technology to interconnect remote supercomputers with ultra-high speed optical data networks which will enable them to work together as units of a very powerful, distributed supercomputing complex. The distribution of supercomputer resources entails many advantages among which, most important for the defense effort, is improved survivability under attack. However, without progress in large scale integration, it also implies a potential loss of computational power. The primary goal of this project is to develop the technology needed to combine the redundancy and survivability of a distributed configuration with the high performance of a closely integrated supercomputer complex. In addition high-speed distributed data environments for multimedia communications and high-density magneto-optics erasable data storage will also be studied.

Very high band-width photonic links among supercomputers could revolutionize parallel and distributed computing. Previous efforts have attempted to develop distributed networks of single processors, to design high bandwidth serial networks among single and few-processor nodes, or to create massively parallel computers with thousands of processors and short communications links. DARPA's Optoelectronics Technology Consortium, for example, seeks a 32 channel/ 500Mbps/channel "in the box" system and testbed. Our goal is to create a backbone optical connection for a distributed massively parallel supercomputer complex, using the University's TMC CM-5 supercomputer and a similar machine in Cambridge, MA. This effort would further the goals of DoD and the High Performance Computing Initiative both by providing a hardware testbed for massively parallel optical communications (100 channels @ 3 Gbps/channel), and by creating a unique laboratory for developing algorithms for high performance distributed supercomputing.

DoD's mission responsibilities would benefit from such massive parallelism in both processors and communications. Extremely powerful computation would become available to supercomputer users on such an interconnection. While they would not necessarily exceed the largest single-site supercomputers, networked supercomputing would be an efficient way to expand capabilities. Such systems would exhibit improved I/O, scalability, local financing and support. Their importance for military applications aboard large ships and in the battle field stems from the increased redundancy and survivability that such a closely integrated configuration of distributed supercomputers can bring about without sacrificing the overall computational performance.

New *high-speed multimedia databases and applications* would dramatically alter DoD communciations and support. Exercising the massive channel capacities offered by photonic connections requires new applications, network management protocols and software. Multimedia live packet-video communications, video-on-demand database services, and real-time data capture, correlation and dissemination will be important data management and support missions for DoD. A testbed will be created for research on the application of ultra-high speed communications and very large storage devices to distributed data environments and multimedia communications.

Improvements in *very high-capacity, high-access storage devices* will be pursued by basic science and technological development in optical erasable storage. Improvements can come from better wide band-gap lasers, better understanding of nucleation and domain growth in existing magneto-optic materials, and by seeking novel storage materials. The effort will complement similar problems in the biomolecular materials efforts. Robust high density optical storage technology will improve DoD's ability to establish and manage databases, collect and synthesize vast amounts of test and sensor data, and to distribute critical information throughout the world.

1.1.6 Supporting and Related Activities

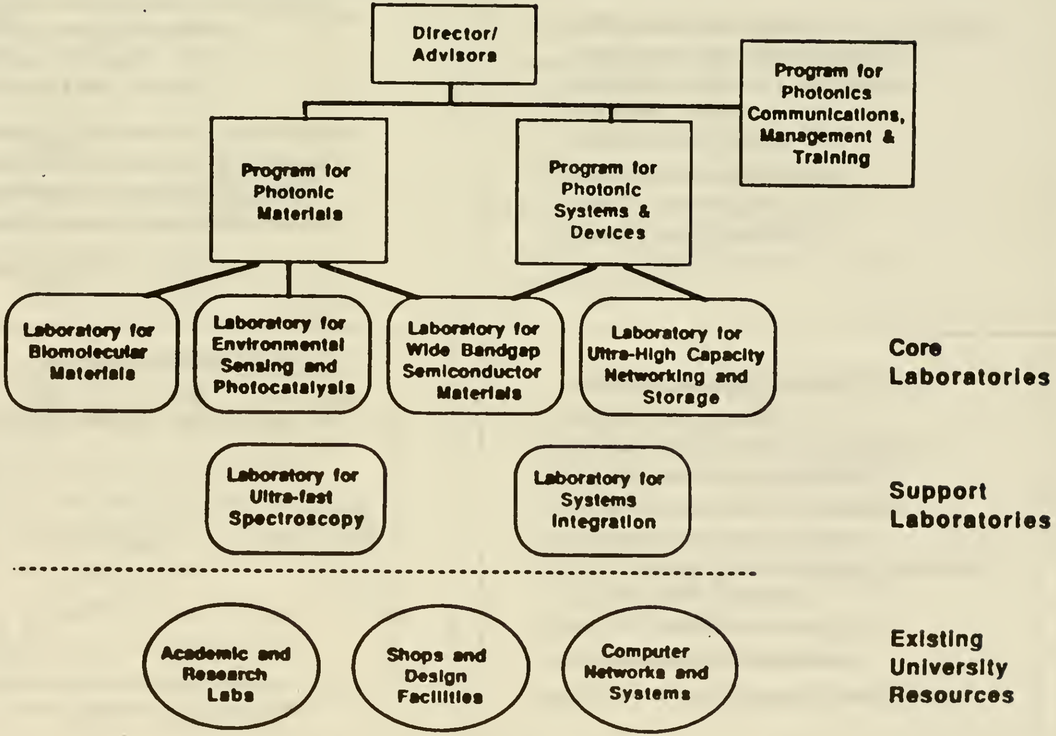
By locating the Photonics Center at a major research university, DoD will benefit from a range of ongoing efforts and facilities. Our four initial core areas have been identified to respond to DoD needs and also to exploit natural collaborations across departments and specialties. We have assembled an outstanding team of researchers in each area. The size of on-campus research activities, reflected in terms of total research funding for Boston University in the physical sciences and engineering was approximately $ 13 million in FY 1992, a figure that has tripled in the last decade. There are about 150 science and engineering faculty, some 800 students in Ph. D. and M. S./M.A. programs, and over 2700 undergraduate majors.

In section 1.2.4 below, specialized "service" laboratories, involving Ultra-fast Spectroscopy and Systems Integration that will provide rare capabilities to the Center are described in detail. Other specialized facilities on campus will further leverage the investment in a Photonics Center. While University cost-sharing in the Center is substantial, these other facilities will create the long-term environment for continued photonics excellence. Within the Metcalf Center for Science and Engineering (in which the University has invested nearly $150 million over the last eight years) can be found modern controlled machining facilities, electronic design facilities, semiconductor and silicon machining clean rooms, MBE and sputtering laboratories, an embedded software design laboratory, and numerous other academic and research laboratories. An outstanding library system exists, along with a strong academic computing environment, the crown of which is the CM 5 supercomputer of the Computational Sciences Center. Modern instructional facilities, including a microwave interactive system for televised instruction to industry, and two-way video conferencing facilities are also available.

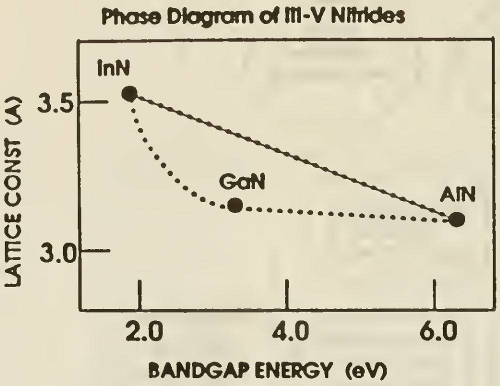
1.2 Organization of the Photonics Center

Organization of the Photonics Center is based on three programmatic themes that will provide structure to the various efforts in R & D and communications and training. Four laboratories will focus staff and facilities on specific scientific and technological problems. Two additional laboratories house fundamental measurement and characterization facilities that will be available to support both major research programs. The figures below show the principal interrelationships among programs and laboratories, and, separately, illustrate in graphic form strategic approaches to three core problems.

Boston University
Center for Photonics Research


Director/ Advisors
Program for Photonic Materials
Program for Photonic Systems & Devices
Program for Photonics Communications, Management & Training
Laboratory for Biomolecular Materials
Laboratory for Environmental Sensing and Photocatalysis
Laboratory for Wide Bandgap Semiconductor Materials
Laboratory for Ultra-High Capacity Networking and Storage
Core Laboratories
Laboratory for Ultra-fast Spectroscopy
Laboratory for Systems Integration
Support Laboratories
Academic and Research Labs
Shops and Design Facilities
Computer Networks and Systems
Existing University Resources

Wide Bandgap Semiconductor Laboratory


Phase Diagram of III-V Nitrides

Electronic and Optical Material Characterization

- X-ray Diffraction Structural Studies
- TEM Cathodoluminescence and STEM
- LEED and Auger Spectroscopy
- Photoemission and X-ray Flourescence Spectroscopy
- Low-Temperature Photoluminescence
- Ab-initio Electronic Structure Calculations
- Electronic Resonant Raman Scattering
- High-Speed Photoconductivity Measurements
- Scanning Probe Microscopy
- Ultrafast Femtosecond Spectroscopy

Materials Synthesis Techniques

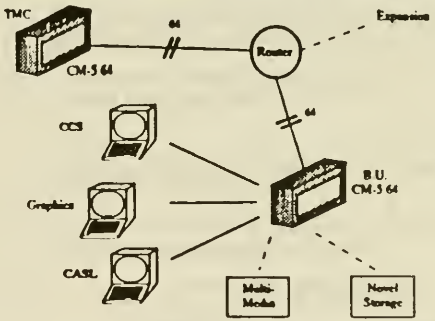
Plasma-Assisted Molecular Beam Epitaxy
- Heteroepitaxial Growth of III-V Nitrides
- n-type and p-type Doping of III-V Nitrides
- Synthesis of Heterojunctions and Superlattices

Fabrication and Processing
- Reactive Ion Etching
- Electron-beam Nanolithography
- Ohmic Contact Formation on n- and p-type

Advanced Device Development

- p-i-n Light Emitting Diodes
- III-V Quantum Well Laser Diodes
- Depletion-mode Transitors
- Field Effect Transistor
- Photoconductive Blue and UV Detectors
- Multi-quantum Well Avalanche Detectors
- High-Temperature Transistors

Ultra-High Capacity Networking and Storage



Extended Parallel Interconnect Computer (EPIC)

- Boston University/Thinking Machines collaboration
- Boston University and TMC CM-5, 64 supercomputers
- Boston - Cambridge optical router
- Several hundred Gbit/s throughput
- Scalability, greater I/O, survivability
- Backbone for metropolitan supercomputer network expansion

High Capacity Data Techniques

- Multimedia networking and databases
  - Network protocols for real-time data
  - Multimedia bandwidth allocation
  - Time-dependent database organization
- Novel Data Storage
  - Vertical Bloch line materials characterization
  - VBL magnetic and optical readout
  - Laser stroboscopic microscopy

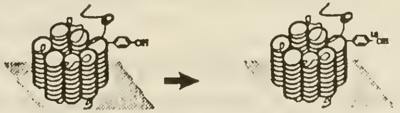
Advanced Systems Development

- 64 channel multi-Gbit/s channel router
- Metropolitan supercomputing network
- Multi-vendor heterogeneous network
- Multimedia network management
- Solid state vertical Bloch line memories
- Optical readout VBL memories
- Laser stroboscopic Kerr microscopy

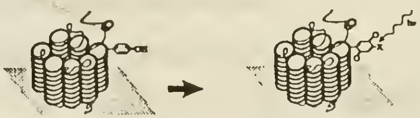
Photonic Biomolecular Materials Laboratory

Advanced Genetic Methods

Site-Directed Isotope Labelling (SDIL)



Site-Directed Non-Native Amino Acid Replacement (SNAAR)



Selected Projects

- Chemical and Biomolecular Sensing
- Engineering with Non-native Amino Acid Residues
- Biomolecular Photonic Memories
- Optically Active Polymer Gels
- Holographic Recording
- Photonic Materials from DNA
- Nanometer Lithography using Biomembranes

Advanced Biophysical Techniques

- **FTIR and FT-Raman Difference Spectroscopy**
  Dynamics and conformational changes at the single residue level
- **Ultra-fast Time-resolved Spectroscopy**
  Response of photonic biomolecules to light from nanosecond to millisecond
- **Scanning Probe Microscopy**
  Structure and self-assembly of photonic materials
- **X-ray Diffraction and Synchrotron Radiation**
  Structure and self-assembly of biomolecules in higher order structures
- **Brilliouin Scattering**
  Thermal fluctuations, structural phase transitions, photoelasticity

Properties of Photonic Biomolecules and Assemblies

- **Model Polypetides and Polymers**
  Photoaffinity linkers, charged-transfer interactions, readout for chemical sensors
- **Proteins**
  Molecular recognition,energy transduction, signal-transduction, ultrafast structural response, proton transport, electron transport, ion transport, self-assembly in 1,2 and 3-D
- **DNA**
  Synthesis of defined lengths, spaced arrays of antibodies and photonic molecules
- **Multilamellar Arrays of Photonic Biomolecules**
  Optical media, holography, picosecond photodetection, chemical and photonic sensing, energy transduction

1.2.1 Program for Photonic Materials

The Program for Photonic Materials will concentrate on the science and technology of creating, characterizing, and fabricating materials with novel and useful optical or electro-optical properties. Three key materials technologies will be addressed: biomolecular materials and processes, photocatalytic materials for environmental sensing and remediation of contaminants, and wide band-gap semiconductors for opto-electronic applications. These technologies were identified based on DoD mission requirements (in Electronic Materials, Materials and Processes, and Environmental Effects) and on complementary University research strengths.

This program deals principally with fundamental science, and joins researchers with a range of specializations, including chemistry, physics, electrical engineering, biomedical engineering, and manufacturing engineering. In many cases this program will involve technology development, as investigations proceed to device-level prototypes. The earliest device development is likely to occur in the wide band-gap opto-electronics area, an evolution reflected by the connections to the Program for Devices & Systems in the figure below.

1.2.1.1 Laboratory for Wide Band-gap Optical Semiconductors

Activities in this laboratory will concentrate on the fabrication and characterization of novel semiconductors with emissions or responsivities in the short wavelength region. Researchers will seek scientific results on the growth of high quality single crystals, the most efficient and effective methods for repeatable fabrication of such materials, and the processes by which the materials can be incorporated into devices or opto-electronic integrated circuits. Samples will be studied to understand the physics of their formation, and to determine their opto-electronic properties. Particular emphasis will be placed on the fabrication of heterojunctions GaN/AlN and devices based on such structures. The Laboratory will contain modern fabrication chambers for III-V nitrides materials, and characterization facilities to study composition, structural and electronic and optical properties.

1.2.1.2 Laboratory for Biomolecular Materials

Often native biomolecules exhibit functions which are potentially useful for the development of advanced materials. One example involves membrane-based receptor molecules which can recognize and respond with high selectivity to a wide range of chemical and biological agents. A primary goal of the laboratory for biomolecular materials will be to develop advanced methods to characterize these biomolecules and to modify them for use in a new generation of biomolecular materials. Research in this laboratory will focus on advanced methods of genetic engineering for incorporation of light sensitive chromophores into biomolecules for sensing and readout and the use of advanced photonic methods for spectroscopic characterization of these engineered molecules.

1.2.1.3 Laboratory for Environmental Sensing and Photocatalysis

Photocatalytic materials are organic or inorganic materials that initiate or accelerate chemical reactions under optical excitation. Some semiconductor materials such as titanium dioxide have been shown to be effective catalysts in light-induced detoxification of pollutants. The characterization of such catalysts will be carried out in this laboratory using techniques that range from materials synthesis to laser irradiation procedures that establish the important mechanisms of charge separation and other features of photocatalysis. A complementary approach will also be employed that will take advantage of ways in which materials respond to light with a spectral signature that often permits sensitive and specific detection. In the sensing and catalysis laboratory, efforts will be directed to development of new detector materials, optical components and coatings, and total detection systems or hardware. These systems could be used in remote sensing operations (fuel or chemical storage facilities) or in radiation detection or protection strategies.

1.2.2 Program for Photonic Systems and Devices

In the Program for Photonic Devices and Systems, researchers will focus on applying fundamental scientific findings to practical applications of importance to DoD and industry. Discoveries in materials will be utilized to create improved detectors, sources, and sensors. At a higher integration level, novel devices will be studied to develop systems with practical mission benefits to DoD. Most activities within this program will fall in the Key Technology Areas of Computers, Sensors, and Human-System Interfaces.

An initial major thrust of this program will involve a demonstration system for optical interconnection of two massively parallel computers. This effort will utilize massively parallel fiber optic links, individually operating above 1 Gb/s, between the University and Thinking Machines, Inc. in Cambridge, to create a distributed metropolitan supercomputer interconnection. Supporting research in multimedia networking, and in high-density storage technology will be conducted.

1.2.2.1 Laboratory for Photonics Links Among Supercomputers

This Laboratory will be the focus for efforts to create a massively parallel optical interconnect. It will utilize advanced commercial fiber optic technology to design, prototype, install and test a working interconnect over a distance of about 3 km. The interconnect will have to be made compatible with the system constraints of the two systems it will link, both TMC Connection Machine 5 , 64 node configurations. The existence of this massively parallel link, with tens of fibers, will provide a unique optical communications testbed for experiments on new source and receiver technologies, data management methods, and networking. When not in use for parallel operation, the link, or subsystems of the link, can be used as a more conventional high speed communications testbed. The multimedia networking testbed will also be located within this laboratory. This system will incorporate a 100 Gbyte storage device and ATM switching and interfaces to develop protocols and network management methods for high volume data applications. The existing Magnetic and Optical Devices Laboratory will work with this Laboratory on expanded efforts in laser flash imaging of high density magneto-optical and bubble materials for storage devices, particularly vertical Bloch lines and RETM media.

1.2.3 Program for Photonics Communications, Management and Training

The goal of the third program of the Center is to promote the dissemination of information about photonics and the activities of the Center. This effort will augment the normal information transfer through scientific publications and presentations and will help accelerate the movement of data and methodology from the laboratory to the development stage in affiliated industry.

The program will facilitate a flow of information and personnel between the Center, DoD and corporations, and coordinate the use of Center facilities by Industry researchers. The expense and specialization of skills needed for most photonics measurement and fabrication make it difficult for smaller firms to establish in-house research or training facilities. It will be under this program that new curricula in photonics will be developed that will include an array of new courses for both undergraduate and graduate students. Degree programs in applied chemistry and physics and in engineering will be expanded to ensure the evolution of a larger more competent work force dedicated to work in photonics. Graduate and undergraduate students studying photonics will be directly supported through funded stipends and tuition grants from the University. This program will also provide guidance to small companies in patenting and licensing activities to assist them in marketing photonics products.

1.2.4 Supporting Laboratories

1.2.4.1 Laboratory for Ultrafast Spectroscopy

The ability of devices to process and transmit large amounts of information rapidly is one of the essential goals of photonics technology. Ultrafast (femtosecond) lasers provide tools for directly measuring material responses in the time domain that approaches the theoretical limits set by nature. The short time measurements of transient optical phenomena are essential to the characterization of photonic materials for a great variety of optoelectronic applications including optical switching, beam steering, information storage and retrieval, laser optical pumping, imaging, displays, new lasing materials, fast charge generation and amplification. Recent technological advances in ultrafast lasers allow the direct time-probing of material responses on the sub 100 femtosecond time scale. Additionally, the high intensities achievable with these ultrafast optical pulses make them an ideal tool for the measurement of nonlinear optical properties.

The ultrafast spectroscopy laboratory would serve (1) as a facility for the *measurement* of material responses and performance characteristics in the terahertz regime (subpicosecond or femtosecond time scale) and (2) as a facility for the development of optical techniques for the *control and manipulation* of material responses via ultrafast coherent radiation. Two classes of novel materials of particular interest here are the large band-gap semiconductors (section 1.1.2) and photonic biomaterials (section 1.1.3). Other classes of materials of interest here include particulate (1.0-0.01 m) semiconducting materials such as TiO_2, CdS and silver halides.

1.2.4.2 Laboratory for Systems Integration

As novel materials are fabricated into devices, and devices into larger components and systems, it becomes critical to investigate their opto-electronic properties at the system integration level. Testing and measurement is needed for design refinement, uniformity and quality control, standards verification, compatibility testing, and system performance measures. Systems integration broadly includes two kinds of measurement techniques: functional testing to determine whether a device performs its desired operation (e.g. light to current conversion) and performance testing, which quantifies how well the device performs (e.g. bandwidth, responsivity).

Equipment will principally consist of advanced commercial instrumentation for measuring electronic, optical, and opto-electronic behavior of components. Custom instrumentation and methods will also evolve from this lab, as many devices will be deliberately reaching beyond the speeds and spectral regions normally available, and will require novel test approaches. The Laboratory will also play an important role by helping to calibrate instrumentation and systems used throughout the Center, and being a resource for commercial testing and evaluation. Because of the high investment required for a first-class system test facility, many smaller firms should benefit by having access to this lab's capabilities.

1.3 Scientific Tasks-Program for Photonic Materials

In this section technical background is discussed for each Core Problem area under the Program for Photonic Materials. These problem areas are proposed as the initial focus of Center activities, based on relevance to DoD mission needs, scientific and technological impact on the field, existing faculty strengths, and available facilities.

1.3.1 Core Problem 1 - Wide Band-gap Semiconductor Materials

1.3.1.1 Potential of III-V Nitrides

The family of refractory nitrides (InN, GaN, AlN) is one of the most promising classes of opto-electronic materials. The three binaries are direct band-gap semiconductors and their energy gaps cover the spectral region from 1.95 eV (InN) and 3.4 eV (GaN) to 6.28 eV (AlN). The successful development of the III-V nitrides will lead to devices such as light emitting diodes, lasers, and light detectors, operating in the spectral region from the visible to ultraviolet, as well as high power, high frequency and high temperature transistors. The unique physical properties of these materials also make them suitable for piezoelectric, opto-electronic, and acousto-optic devices. Heterojunctions, quantum wells, and superlattice structures are expected to show novel low-dimensional electronic behavior due both to the strong quantum confinement and to the lack of defects associated with the transition from direct to indirect semiconductors, a problem common in $GaAs/Al_xGa_{(1-x)}As$ systems.

The development of efficient devices out of this class of materials will have an enormous technological impact. For example, short wavelength blue lasers can immediately replace all long wavelength red lasers in compact disks, photocopy machines, and magneto-optical storage, multiplying by four the density of information stored. Efficient blue LED's will lead to additional applications such as true color copying and full color, flat-panel displays, effectively replacing all tube type TV's and monitors in the next ten years. The development of blue and UV lasers and light detectors will also be very important to underwater and space-to-space communications. The Laboratory for Wide Band-Gap Semiconductors proposed here will have a major impact on the synthesis and characterization of these materials.

The synthesis of bulk crystals of GaN and AlN by equilibrium processes has led only to the growth of millimeter size single crystals, thus the focus has been on heteroepitaxial growth of films on foreign substrates. In spite of recent progress (1,2), a number of significant problems remain unresolved:

- The unavailability of native substrates for the development of homoepitaxial films.

- The layer-by-layer mode of growth needs to be developed in order to advance opto-electronic devices with atomically sharp surfaces and interfaces.
- Methods need to be developed to minimize the formation and propagation of defects due to heteroepitaxial growth.
- More thorough understanding of the nature and origin of defects and impurities is required to advance efficient doping.

1.3.1.2 Project Goals

The goals of the efforts of core problem 1 are the synthesis and characterization of refractory III-V nitrides and rare earth nitrides and the fabrication of heterojunctions and devices. Specifically, the program has three interrelated subtasks:

Develop the growth of III-V nitrides by Plasma-Assisted Molecular Beam Epitaxy. Specific subtasks include:

- Study the heteroepitaxial growth to produce atomically smooth surfaces and interfaces and to minimize propagation of defects from the substrate
- Develop methods to form intrinsic compounds and alloys and intentionally dope these materials p- and n- type
- Grow high quality heterojunctions and superlattices

Determine the atomic and electronic structure of III-V nitrides using state-of-the-art spectroscopies and theoretical approaches. Specific subtasks include:

- Single crystal XRD, TEM, LEED and Auger spectroscopy
- Photoemission, inverse photoemission and X-ray fluoresence
- Measurement of optical and transport constants
- Study of defects by TEM cathodoluminescence and photoluminescence
- Determine the electronic structure of defects by ab-initio calculations

Develop devices and processing for the fabrication of structures based on bulk layers, homojunctions and heterojunctions; study their transport and optical properties. Specific devices to be fabricated and evaluated will be LED's lasers, light detectors, and FET's.

1.3.1.3 Recent Progress at Boston University

- *Development of a quasi layer-by-layer growth (3-5):* A two-step growth process was developed which leads to a small two-dimensional nucleation rate and high lateral growth rate. High quality cubic-GaN films were grown on Si (100) using this two-step process, contrary to previous results which produced either amorphous or polycrystalline wurtzitic films. Also, semiconducting ScN was grown for the first time by the ECR-MBE method.
- *Development of semi-insulating and n-type and p-type GaN films (4,6,7):* Plasma modes with high nitrogen plasma density were identified which allow the growth of semi-insulating GaN films. GaN films were also doped n-type with Si and p-type with Mg, respectively. Si was incorporated as a donor with net carrier concentration of $N_D - N_A = 2 \times 10^{18} cm^{-3}$, while Mg was incorporated as an acceptor

with N_A-N_D ≈ 2 x10^{19}cm^{-3}. Conducting GaN films with mobilities of 210 cm^2/V-sec at N_D-N_A =2 x10^{17}cm^{-3} have been produced, far superior to previous MBE films.

- *XRD and Photoemission Studies of GaN (8):* Using XRD, we found that in predominately wurtzitic GaN films with close-packed planes parallel to the substrate, domains of zincblende GaN exist, nucleated at stacking faults. Photoemission spectroscopy of sputtered cleaned cubic and wurtzitic GaN thin films have shown encouraging initial results, with the determination of the valence band density of states.
- *Ohmic contacts/Processing of GaN (9):* A direct correlation between the metal work function and barrier height to GaN was found, allowing ohmic contacts to both n- and p-type GaN by choosing metals with the appropriate work function (Al for n-type, Au for p-type). Additionally, dry etching techniques have been developed to process GaN films.

1.3.1.4 Research Tasks in the Laboratory for Wide Band-gap Semiconductors

Studies of Heteroepitaxial Growth - T. D. Moustakas

Film growth by the ECR-MBE method involves the reaction of thermal beams of In, Ga, and Al, with a beam of ECR excited nitrogen. The ECR-MBE method has the following advantages over existing high temperature CVD methods: 1.) Growth occurs at low temperatures, making it easier to control film stoichiometry, form intrinsic material, and, since interdiffusion is reduced, grow heterojunction structures with atomically sharp interfaces. 2.) Ultra high vacuum (UHV) minimizes the incorporation of undesirable impurities, as well as allowing for the incorporation of surface probes to study the structure and chemistry of the substrate and film. 3.) Ion or electron assisted growth and doping can be attained through proper substrate biasing.

III-V nitrides are strongly bonded materials and exhibit very little wetting to the substrate. Thus both growth dominated (growth pattern is columnar and three dimensional) as well as nucleation dominated (large nucleation rate yields uniform coverage) growth occurs. Since the nucleation dominated regime is at low temperatures, we have developed a two-step growth process for GaN: A low temperature GaN-buffer is followed by higher temperature growth. The temperature and the thickness of the GaN-buffer are *very critical parameters* and are going to be optimized during this program. Recently, we developed an atomically smooth AlN-buffer by plasma nitridation of sapphire (0001), and found that the growth of a GaN-buffer on the top is also atomically smooth (3). This combination of AlN- and GaN-buffers will be explored in greater detail. Also during this program, we propose to investigate the plasma from the ECR source by emission spectrometry, Langmuir probe, and Faraday cup measurements, in order to establish the ratio of ions to radicals and determine their relative importance for film growth. Using the two-step growth process in the ECR-MBE method leads to completely insulating GaN films. Thus, one should be able to dope these films n- and p-type by using proper donors or acceptors, and we have had recent success incorporating Si into semi-insulating GaN films as well as Mg as a p-type dopant.

Atomic Structure of III-V Nitride Films - K. Ludwig

It has long been known that GaN exists in two polymorphs: the wurtzite and zincblende structures with direct band-gaps of 3.46 eV and 3.26 eV respectively. Our comprehensive x-ray diffraction studies(8) have shown that wurtzite and zincblende GaN polymorphs often coexist in films which grow with their close-packed stacking planes parallel to the substrate. The zincblende phase may nucleate at stacking faults, which the x-ray data show to be relatively common in the predominately wurtzitic films. We have also shown that the zincblende phase exists equally in its two twins which can similarly nucleate from each other at stacking faults. A major focus of the materials synthesis effort will be the growth of wurtzite (0002) films with fewer stacking faults and films of other orientations with better orientational order and larger domain sizes. Moreover, we propose to systematically examine the thin buffer layers which are essential for the growth of high quality material. Since the buffer layers are thin (≈100Å), glancing incidence techniques will be used to examine their strain, stoichiometry and epitaxy.

Electronic Structure in III-V Nitrides - K. E. Smith

There is a vital need to understand the electronic structure of the III-V nitrides before electronic and optical devices can be designed. We will measure the structural features of the pure material themselves, and the structure of defects, impurities, and dopants in the films, and the nature of the nitride interfaces using sophisticated spectroscopic probes. Photoemission spectroscopy will be used extensively to measure band dispersions, densities of states, and bonding interactions in these nitrides. Inverse photoemission spectroscopy will be used to directly measure the structure of unoccupied electronic states (which are the final states of any optical transition) in the nitrides. The local electronic structure of states far (100Å) from the surface and of impurities and dopants will be measured by soft x-ray fluorescence spectroscopy. A full understanding of electronic structure in these nitrides will explain the transport and optical absorption properties, while studies of the various interfaces will clarify issues of growth and chemical stability, and of metal bonding to the films.

TEM Cathodoluminescence Assessment of Defects and Impurities - R. Graham

Cathodoluminescence (CL) performed in the analytical transmission electron microscope (TEM) provides a means of detecting and imaging electrically and optically active defects and impurities at high spatial resolution, allowing the correlation of emission spectra with microstructural features, such as dislocations, strained regions or other defects. Recently, we have obtained preliminary TEM CL results on cubic-GaN layers that suggest that misfit dislocations, arising from lattice mismatch with the substrate, give rise to states deep within the band-gap (3). We have also observed enhanced near band edge CL at about 3.43eV at stacking faults in Be-doped cubic GaN, which we tentatively attribute to Be segregation to these defects (4). TEM CL will establish the spatial distribution of optically active centers and their association with the microstructure, and indicate, for example, whether dopants are introduced uniformly or segregating to some defect structure. These aspects will be studied as a function of (a) the nature (i.e. composition, thickness, growth conditions) of buffer layers on the substrate; (b) growth conditions of the epilayer; (c) alloying to produce ternary phases.

Theory of Intrinsic Defects and Dopants in III-V Nitrides - Y.Bar-Yam

The objective of the theoretical component of this research is a microscopic theory of the influence of off-stoichiometry, defects and impurities on the synthesis and electronic properties of the III-V nitrides. Detailed studies of the properties of intrinsic point defects and impurities are designed to enable thermodynamic analysis of defect concentrations, doping and phase stability. Theoretical analysis of the electronic states associated with defects are designed to enable identification of observed defects by comparison with experiment. Studies of the dynamics of these defects will focus particularly on photoinduced and electron-assisted defect migration mechanisms which have previously been found in both silicon and GaAs. Such processes are directly relevant to the stability of lasers and other photonic devices. We will utilize *ab-initio* calculations of the properties of intrinsic point defects and impurities for a thermodynamic analysis of the properties of off-stoichiometric materials in equilibrium. Conclusions can serve as guidance for improving growth rate or perfection, doping and material stability. Four point defects are to be investigated initially, two vacancies, and two anti-site defects: V_{Ga}, V_N, N_{Ga}, and Ga_N

III-V Nitride Processing and Device Fabrication - W. Skocpol, S. Unlu, B. Goldberg

Successful realization of devices and, in the long term, integrated circuits in GaN requires the development of the standard array of semiconductor process techniques. These include metal/GaN ohmic contacts, gate level Schottky barrier formation, etching of GaN and oxide or epitaxial barrier overlayers, diffusion of dopants and the activity of ion-implanted regions. We have studied (9) the effect of different metalizations on n-GaN (Au, Al, and In) and have succeeded in making low-resistance, device quality ohmic contacts to n-GaN ($2\times10^{-7}\Omega m^2$). Unlike the III-V GaAs system, our results show that different metallic overlayers result in different barrier height formation on GaN. Reactive Ion Etching (RIE) has been successfully performed at etch rates of ≈150Å per minute with excellent vertical side walls and little damage to the lithographic photoresist layer. These preliminary results are encouraging to the future of devices made from GaN thin films and heterostructures.

Transport Physics and Devices - W. Skocpol

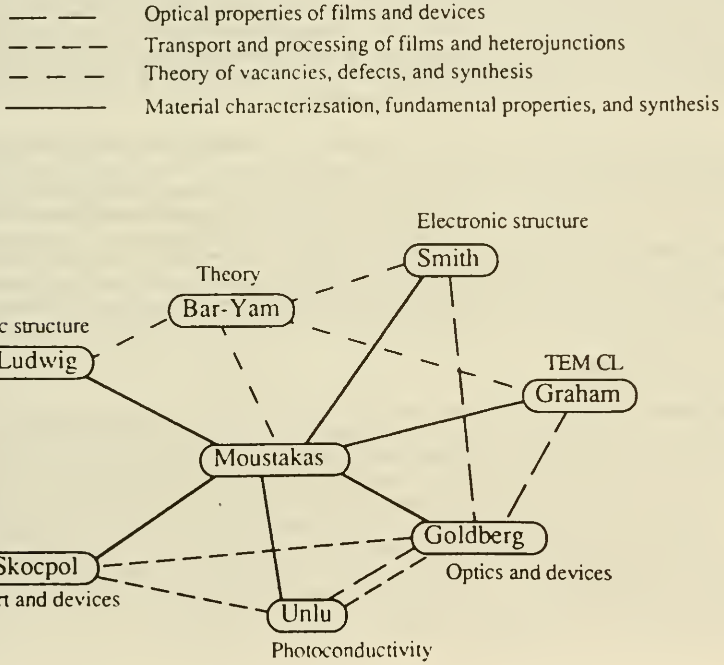
The primary goal of the transport physics effort will be the development and testing of gated transistors in the GaN/$Al_{(1-x)}Ga_xN$ heterostructure materials system, and their use in opto-electronic circuits. The initial focus will be on basic FET technology, extending later to patterned, multi-contact and multi-layer systems. The transport behavior of contacts, wide layers, and narrow constrictions will be measured, providing information about process edge damage and allowing assessment of the material's future in ultra-small devices. Diffusion and ion implantation of n- and p-type contacts will be pursued. The dielectric strength and defect density of AlN and $Al_{(1-x)}Ga_xN$ wide band-gap barriers on GaN will be studied, and capacitance-voltage measurements will be used to characterize doping profiles in the films. GaN/$Al_{(1-x)}Ga_xN$/GaN layers will be studied, and such capacitor structures will be used to form a simple depletion-mode transistor.

Optical Devices and Characterization of III-V Nitrides - B. Goldberg

The III-V nitrides possess a wide, tunable, direct band-gap making them ideal for the creation of short wavelength emitting devices. Our research goals are three-fold: optical parameterization of films and heterojunctions for feedback to the synthesis effort; realization of blue- and UV-light emitting devices and lasers; and the pursuit of novel physics in heterojunctions. Optical characteristics like the width of the free-carrier emission, the temperature dependence of excitonic emission, donor and acceptor related optical activity, and Urbach absorption processes below the band edge all can be used to characterize and understand the properties of the films and heterojunctions. In parallel, light emitting devices and lasers will be fabricated. The focus will be on various multiple quantum well (MQW) $Al_{(1-x)}Ga_xN$/GaN/$Al_{(1-x)}Ga_xN$ structures due to the significant optical efficiency enhancements over diodes as well as their use in many other semiconductor devices. Initial studies will examine interface quality, remote doping and carrier transfer, and strain effects. Second stage research will concentrate on the patterning and structure of MQW's buried between n-type GaN and between n- and p-type layers. The electroluminescence and optical pumping properties of these structures will be thoroughly investigated. Light emitting diode operation as well as cavity formation and laser operation will be pursued.

- *Optical Detectors - S. Unlu*

A technologically important area for the application of III-V nitrides is in blue and UV detectors. Detectors sensitive to blue light will complete the primary color spectrum in semiconductor devices. Detectors in the blue and UV wavelengths, and essentially transparent to longer wavelengths, can be used to detect UV emission from flames in the presence of hot backgrounds. Additionally, space communications require emitters and detectors in the 240-280 nm wavelength range in which the earth's atmosphere is nearly opaque. Therefore space to space communications in this band would be secure from earth. We propose to investigate photodetectors in GaN/AlGaN material system. Recently, insulating GaN epitaxial layers were successfully grown on sapphire substrates enabling the formation of photoconductive UV detectors. With the advent of the doping of nitrides, the formation of heterojunctions, and the aforementioned processing techniques, device structures for blue and UV detectors can become more complicated and elegant. These devices will combine high speed properties with high quantum efficiency. We also propose a novel approach for incorporating the transient solution of semiconductor equations within a general circuit simulation tool, which eliminates the need for interfacing various device and circuit simulation environments. The simulation efforts will be directed toward heterojunction photodetectors in wide band-gap semiconductors.


Optical properties of films and devices
Transport and processing of films and heterojunctions
Theory of vacancies, defects, and synthesis
Material characterizsation, fundamental properties, and synthesis
Electronic structure
Smith
Theory
Bar-Yam
Atomic structure
Ludwig
TEM CL
Graham
Moustakas
Goldberg
Optics and devices
Skocpol
Transport and devices
Unlu
Photoconductivity

1.3.1.5 Overview of the Boston University Program on WBGM

The synthesis, characterization and development of refractory III-V nitrides, together with the investigation of their fundamental physical properties, is a major task that requires significant intellectual and material resources. The group comprising the Laboratory for Wide Band-Gap Semiconductors contains experts in the fields of epitaxial growth (Moustakas), experimental solid state atomic structure (Ludwig), electronic structure (Smith), electron microscopy (Graham), optical and transport properties (Goldberg, Skocpol), device design, fabrication and characterization (Goldberg, Skocpol, Unlu), and in electronic structure theory (Bar-Yam). The core of the Laboratory is the synthesis of the nitrides themselves. As new material is produced, it will be provided to each of the Laboratory members for characterization, and as each measurement is made, the results will be fed back directly to the synthesis stage, allowing the rapid incorporation of the results into the growth process. Thus, a large number of collaborations exist (note fig. above) and further cross-linking within the WBGS group will be fostered in Center activities.

1.3.2 Core Problem 2 - Biomolecular Materials

1.3.2.1 Specific Aims

Recent advances in the fields of biophysics, genetic engineering and condensed matter physics are making possible the development of a new generation of photonic materials. These materials incorporate functioning biomolecules and will be endowed with the ability to self-assemble, to react to a wide range of external stimulii and to respond dynamically by altering their optoelectronic properties. Biomolecular materials are likely to play an important role in the future of photonics and in the fields of molecular sensing, nanoengineering and rapid communications systems.

An important requirement for the development of photonic biomolecular materials is the ability to manipulate biomolecules at the nanometer level. In this regard, several new technologies are emerging. They include methods for incorporating non-biological components into biomolecules such as light emitting and absorbing chromophores, methods for assembling biomolecules into complex structures and methods for deciphering the functional mechanism of biomolecules at the molecular level. A central goal of the Photonic Biomolecular Materials laboratory will be to further develop and use these emerging technologies for the design of advanced photonic materials. Significantly, the proposed Photonics Center and its unique infrastructure will be well suited to achieve this goal.

1.3.2.2 Background

Biomolecules present an attractive target for use in photonic materials because of their many "smart" properties including self-assembly, signal-transduction, ion transport, molecular recognition and ultrafast dynamic responses. For example, many biomolecules or complexes of biomolecules respond to light by undergoing a set of well defined responses. In the case of bacteriorhodopsin, photon absorption initiates an optoelectronic response which occurs on the femtosecond to millisecond time scale and results in transport of a proton through a so-called proton wire. The high quantum efficiency of bacteriorhodopsin, the ability to incorporate it into stable films and the existence of a photocycle that can be repetitively triggered has raised the possibility that it is suitable for a variety of photonic uses including holography, optical recording and non-linear optics.

A second example involves the membrane receptors, a diversified class of proteins which respond to a variety of signals including light, cellular growth factors and neurotransmitters. This class includes the nicotinic acetylcholine receptor (nAChR), a ligand-gated ion channels which performs a central role in signal transduction across post-synaptic membranes. Through a combination of genetic engineering and material processing techniques, it should be possible in the future to utilize the molecular recognition capability of these proteins to make a new generation of biomolecular materials.

Biomolecules which are not themselves "photonic" also offer important opportunities in the development of photonic materials. For example, many biomolecules are able to spontaneously self-assemble into 1-, 2- and 3-dimensional periodic arrays and can therefore serve as the scaffolding in molecular electronic devices. One example is DNA, which when combined with antibodies can form the basis for construction of precisely spaced linear arrays of molecules. Many biomolecules such as bacteriorhodopsin and proteins in the S-layer of archaebacteria can organize into 2-d periodic arrays. Arrays of these biomolecules have been used successfully as templates for nanometer lithography and thus may form the basis for high density optical memories. Biomolecules can also form 3-dimensional crystals and when modified using genetic engineering could serve as templates for even more complex molecular opto-electronic circuits and higher density memories.

Despite these opportunities, significant problems remain in the use of biomolecules in photonic materials and photonic devices. Foremost among these problems is the need to preserve the functionality and structure of biomolecules in synthetic materials. Related problems include development of more powerful methods to alter biomolecules for biomaterial use and to evaluate their altered structure and function. These core problems will be the central focus of the Laboratory for Biomolecular Materials.

1.3.2.3. Selected Projects

New Methods of Engineering Smart Photonic Biomolecules - K. Rothschild and G. Jones, in collaboration with U.L. RajBhandary, MIT)

The design of photonic biomolecular materials can be greatly facilitated by a basic knowledge of how the component biomolecules function. In addition, the production of these materials depends on the development of more powerful methods of engineering biomolecules. Both of these goals are the central focus of a new project sponsored by a DoD University Research Initiative Award (K.J. Rothschild-P.I., "New Biophysical and Genetic Methods for Advanced Material Development"). Bioengineering of proteins is presently based on the ability to substitute one or more amino acids in a protein sequence with other naturally occurring amino acids. Recently, a new method has been reported by Schultz and coworkers at Berkeley which allows natural amino acids in proteins to be substituted with non-native amino acids (10). This approach, which we refer to as site-directed non-native amino acid replacement (SNAAR), expands the horizons of biomaterial development by providing the protein engineer with a larger ``vocabulary"; i.e. the ability to incorporate synthetic components into proteins which can modify their function and adapt them for material environments. While the feasability of SNAAR has been demonstrated by the Schultz group (10), this approach will not be useful for basic research and advanced material development until practical techniques are developed for the efficient and increased production of SNAAR protein. The present proposal encompases efforts to optimize the in-vitro production of SNAAR proteins using continuous flow techniques and design of expression vectors and characterization of SNAAR proteins using advanced biophysical methods including Fourier transform infrared difference spectroscopy.

Photonic Biosensors of Toxins Using Native Membrane Protein Receptors - K. Rothschild, G. Jones, in collaboration with K. Miller (Harvard Medical School)

The ability of membrane based receptor molecules to recognize and respond with high selectivity to a wide range of chemical and biological agents makes them attractive targets for utilization in advanced biomolecular materials. The coupling of these receptors to fluorescent or absorbing chromophores is particularly advantageous, since this tagging provides a convenient and sensitive method to read out the binding of target molecules in the environment such as neurotoxins. In this project, the protein nAChR is serving as a model in the development of techniques for incorporating functional membrane protein receptors into advanced biomolecular materials with biosensing function. In a first generation chemical sensor based on this neuroreceptor, it was demonstrated (11) that natural and artificial membranes which contain AChR can be incorporated into functioning multilamellar films. By using the fluorescent reporter molecule, ethidium bromide, it was shown that the receptor remains active in these films and responds to low concentrations of agonist (i.e. acetylcholine) by undergoing desensitization which is "read out" by the fluorescence change. Natural blockers such as the poison, α-bungarotoxin, can also be detected by their ability to block the characteristic fluorescence response.

In future work, nAChR and other membrane receptors will be reconstituted into artificial membranes using different lipid mixtures which support function (ligand activated cation flux). These membranes will be incorporated into thin ffilms which are deposited on different substrates such as IR transmitting crystals and optically clear windows and will be studied using advanced spectroscopic methods. EtbR and other custom designed fluorescent tags will be used to characterize the sensitivity of the films to agonists and other agents, to determine film stability and its selectivity for sensing target agents. In complementary studies, the response of the film at a molecular level will be studied using FTIR difference spectroscopy combined with attenuated total reflection. Professor Rothschild's laboratory has recently demonstrated the ability of this approach to detect small conformational changes in the receptor upon its interaction with the binding ligand.

Optically Active Biomolecular Materials - R. Bansil, B. Goldberg, K. Rothschild

Near-Field Scanning Optical Microscopy (NFSOM) This unique probe allows both imaging and spectroscopy of materials at resolutions far below the diffraction limit. Currently under development in the laboratory of B. Goldberg, an NFSOM consists of a tapered optical fiber mounted to atomic resolution piezo-electric x-y-z motion control. The optical fiber can be tapered to cleaved-end sizes ranging from 5000A to 200A. The fine tip allows the optical study of nanostructures by exploiting the near-field effect: The material under study is optically excited only beneath the fiber tip, yielding resolutions approaching l/40. In addition to studying semiconductor nanostructures, the NFSOM will play a large role in biomaterial optical recording, imaging live biological systems, magnetic domain recording media, and other photonic systems. Drs. Goldberg and Rothschild are collaborating on a project that would increase the capacity of optical memory devices up to ten thousand times by using bacteriorhodopsin (bR) as the basic memory element. The NFSOM would then be used to read and write small groups or single, ordered molecules of bR. In magnetic domain recording media, the NFSOM will find use as the first tool to "see" the local structure of a vertical Bloch line, the main component in bubble memory devices.

Three-dimensional optical recording media - Dr. Bansil has begun to examine optically active 3-D polymer gels. One application of such gels to high-speed photonics memories is the possibility of creating and studying systems which have a 3-D recording capability as well as a time dependent "memory loss." Non-linear optical properties provide a technique whereby a laser beam focussed through a "template" leaves an image of that template in a particular region of the photo-active gel. This region can be imaged onto an external array detector. Scanning a probe beam then allows a reconstruction of the "template" from that region, as well as other "templates" written in other regions of the 3-D cube of gel. One particular advantage is that the viscosity of the gel can be adjusted, so that the rate of mixing is varied and the "memory" is lost automatically over any desired time scale, from minutes to days.

Holographic Recording Media - Photonic biomolecules when incorporated into films can provide the basis for novel holographic and non-linear optically active materials. Prof. Rothschild's laboratory, in collaboration with H.G. Khorana's at MIT, is producing and characterizing the properties of genetically modified bacteriorhodopsin with the goal of identifying mutant forms with interesting optical properties. One such example is the mutant Asp96 to Asn (D96N) which was evaluated by Hampp and coworkers (11) . Normally, bacteriorhodopsin exhibits a millisecond decay during the photocycle transition from M to N states, which absorb at 412 and 550 nm, respectively. By utilizing the D96N mutant, which has a drastically slowed M to N transition, these researchers could produce bR films with high diffraction efficiency for real-time optical pattern recognition. A major goal of the biomolecular materials laboratory will be to continue the production and characterization of bR mutants for use in holographic recording media.

Nanostructure Engineering of Photonic Biomolecular Materials - C. Cantor, C. Smith, G. Jones, and K. Rothschild)

Novel Composite Photonic Materials form DNA - Drs. Cantor and Smith are working to place biomolecules in arrays of precise architecture through biomaterial-directed nanoengineering. One approach to this goal involves the key ingredients, antibodies (or their specific combining sites), streptavidin (and chimeric fusions to other proteins) and DNA. Antibodies recognize specific receptor domains on cell surfaces. DNA molecules serve as the scaffold used for the construction of precisely spaced arrays of antibodies. Our ability to synthesize DNA molecules is highly developed; any sequence of any length can be made by existing technology. These DNAs form a set of molecular rulers which cover distances up to 20 nm. DNA is chemically quite stable, and the specificity of DNA-DNA and protein-DNA interactions can be used to orient or "dock" other smaller molecules or proteins in a highly selective way along a linear DNA template. Streptavidin is a universal coupler that allows us to tightly attach antibodies to DNA or attach other proteins to either component. It is a tetrameric protein, so it acts as a vertex to bring together up to four different species. A series of simple streptavidin-DNA-antibody conjugates will be made and tested in a number of direct ways. DNAs can be synthesized at almost any desired length. For double strands shorter than 50 base pairs, they behave as rigid rods, 34 nm in length per base pair.

Streptavidin will be used to bring new functionalities to these antibody-DNA complexes. For example, streptavidin fusions with metallothionein have been made. These still bind biotin, so they can easily be attached to a variety of proteins and DNAs. However, they also bind 28 to 48 metal atoms of many different types. This allows us to make conjugates of biomolecules with large numbers of transition metals or heavy metals. We have just begun to explore the properties of these novel materials. Over the next few years other fusions will be made that will allow streptavidin to function as an optical relay by conjugation with proteins capable of fluorescence energy transfer.

Streptavidin conjugates will also be examined by scanning force microscopy (SFM) to characterize the conjugates and also as an aid for developing the tool into a more effective way to observe and manipulate biological molecules and cells. Recently, we have had tremendous success in imaging DNA-streptavidin-antibody conjugates by SFM. DNA molecules may be able to serve as molecular switches in nanodevices. Recent work has shown that DNA junctions (recombination intermediates with four ends) exist in two very different structural states that are favored by different salt concentrations. The extent of DNA motion when the structures switch is quite large, and it is controllable by adjustment in the lengths of the four DNA arms. This suggests that DNA may be able to serve as a coupling agent to detect ion flux or the electrical fields which can generate such fluxes.

Photo-electroactive Conjugates of Synthetic Peptides: Molecular Wires- Investigations in the laboratory of Professor Jones concern the photochemistry of polypeptides that have been modified through covalent attachment of organic chromophores and electroactive subsituent groups. An objective of the research is the demonstration that electron transfer between a bound dye and pendant groups that are native to the biopolymer can be observed, along with charge migration on the polymer surface. Specific peptides designed as "molecular wires" incorporate tryptophan, tyrosine and other electroactive amino acids in periodic arrays that depend for their long range order on α-helical peptide conformations. Other types of peptide scaffolds under study include the peptide electrolyte, polyglutamate. This novel peptide is induced to adopt large a-helical arrays by electrostatic binding of organic counter-ions that are either light absorbing or electron transfer agents. Long range, vectorial (one-dimensional) charge migration appropriate to development of a molecular rectifier is investigated for these systems using fast kinetic phototransient laser techniques.

Biomembrane Nanometer Lithography. The patterning of materials on a nanometer scale is an important technological goal which would facilitate the fabrication of new materials. For example, the development of molecular electronic devices, biosensors and other advanced biomaterials depends to a large extent on being able to arrange functioning biological molecules in nanometer patterns. In a collaboration between K.J. Rothschild and the laboratory of N. Clark and K. Douglas at the University of Colorado, methods for using self-assembled 2-dimensional membrane arrays to pattern solid-state surfaces on the nanometer scale have been developed. We have shown (12) how a two-dimensional pattern of holes in a thin metal layer can be produced by using S-layer from *Sulfolobus acidocaldarius* as a mask. More recently, we demonstrated a process for making nanoheterostructures (13) wherein individual ferritin proteins selectively self-assemble onto a 1.2-nm-thick Ta/tungsten oxide film which had been patterned into a hexagonal lattice with holes of 22 nm periodicity.

Biophysical Approaches to Study Photonic Materials - B. Chasan, K. Ludwig, K. Rothschild, T. Tibbitts, L. Ziegler

FTIR and FT-Raman Difference Spectroscopy: In the past decade, Fourier transform infrared (FTIR) spectroscopy has become increasingly useful for probing biological macromolecules (14). FTIR is particularly well suited for studying photonic biomolecules, which are often not easy to examine with other currently available techniques. FTIR can provide information not available from crystallographic data, and in particular, FTIR difference spectroscopy is sensitive to a variety of changes in the local environment of chemical groups that would not easily be detected by crystallographic techniques. FTIR difference spectroscopy has been successfully applied in the past ten years to a number of biomolecules which are activated by light. Conformational changes occurring during the bR photocycle have been detected at low-temperature and partial dehydration (15,16).

Similar methods have been applied more recently to rhodopsin, sensory rhodopsin I and the nicotinic acetylcholine receptor (nAChR) (17, 18).

Scanning Probe Microscopy: A well-equipped facility for scanning probe microscopy will provide a key technique for photonic materials research. Piezoelectric-based microscopes are a rapidly developing technology for visualizing and manipulating surfaces of materials at the nanometer scale in some cases to near atomic resolution. A combination atomic force/scanning tunneling microscope will be invaluable for structural characterization of optically active thin films and biomembranes, providing information needed to guide synthesis and fabrication of novel photonic materials. These microscopes provide a way to "see" and evaluate the results of an experimental procedure at the molecular level, and therefore diagnose and correct problems which may be difficult or impossible to do otherwise. In addition to serving as imaging devices, scanning probes have experimental uses as nanometric tools for manipulation of single molecules on a surface.

1.3.3 Core Problem 3 - Environmental Sensing and Photocatalysis

The need of Defense agencies has been documented for new cost-effective technology for detoxification or destruction of pollutants or hazardous materials generated in DoD operations. The pollution of ground and surface water in the vicinity of military bases with organic solvents and fuels is among the most urgent problems. In addition, there is a critical need for technology to destroy organic components of ordnance which have exceeded allowed "shelf-life" or is located on practice ranges and former battlefield sites. A third kind of problem involves the sensing of chemical warfare agents and their precursors (e.g., in binary delivery systems) to meet the requirements of federal law or international agreements to which the U. S. is a party. Cost-effective technology developed to meet any of these needs would be applicable to the enormous commercial market for treatment of industrial waste streams and civilian-generated polluted ground and surface water and air. Current projects at Boston University include the development of new methods for the remote sensing of chemical warfare agents or hazardous wastes. Other efforts are focused on the development of solid surface catalysts that will use light to activate the destruction of pollutants at solid-liquid or solid-gas interfaces.

1.3.3.1 Sensor Systems for Monitoring Chemical Warfare Agents at Low Concentrations.

(G. Jones, in conjunction with Boston Advanced Technologies)

For more than half a century, the United States has maintained a stockpile of highly toxic chemical agents and munitions for possible use in a wartime situation. These chemical agents are stored at several US Army depots in the continental US as well as on foreign sites. Each depot varies in the type and number of agents and munitions in storage and in its proximity to off-site civilian populations. The need for sensitive monitoring technology around the storage facilities is evident. This monitoring need is even greater since the Chemical Demilitarization Program was established in response to Section 1412 of the 1986 Defense Authorization Act (Public Law 99-145) that directs the DoD to destroy the complete unitary chemical stockpile by 1994 in conjunction with the production of binary chemical weapons. An effective proximity sensor system for chemical agents is clearly required to meet the new strict requirements for both monitoring treaty verification and Chemical Demil operations.

With the assistance of Boston University faculty, Boston Advanced Technologies, Inc. (BAT), has developed a prototype for an innovative field-deployable system for detection and identification of organic chemical pollutants in water sources that is applicable to the detection of chemical agents under military control. The system utilizes laser Raman light scattering as the spectroscopic sensor forming the core of the approach and employs *surface-enhanced Raman scattering* (SERS) combined with fiberoptic collection of the enhanced scattered light signal in its sampling system to augment the normally low intensity Raman scattering signal from trace materials. The system has been effective in detecting organophosphorus compounds, such as the pesticide, parathion, in water down to the parts-per-billion (ppb) concentration level.

Laser Raman spectroscopy has been used for several years in analytical chemistry as a highly discriminating analytical tool, especially well suited for measuring components dissolved in aqueous samples. With present-day laser sources, high resolution Raman spectra may be run in minutes over a wide frequency range to give rapid and reliable identification of the chemical components in a mixture, based on their vibrational spectral features. Raman spectroscopy can be deployed without the limitations that result from broad-band water absorbance in critical spectral regions that will often obscure conventional infrared spectra. However, for trace organic contaminants, despite the high resolution capability of Raman spectroscopy, the scattering power is low and the scattering signal is difficult to detect through an optical fiber. Our approach is to augment the Raman intensity through incorporation of a sample chamber integrated into an optical fiber bundle in which the sample to be measured is in contact with silver or gold coated microspheres. These microspheres enhance the Raman signal for any molecular species which adsorbs to or near the microsphere surface.

We have designed a laser diode-pumped fiberoptic system for a new generation of potentially field deployable Raman monitoring systems. The system design is small, compact, portable and field reliable and can be configured for direct reporting or automated remote operation. It incorporates a diode laser interfaced to an optical fiber bundle which both transmits the laser light as the scattering source and collects the light scattered back at the fiber tip. The scattered light is returned to a transmission grating and a solid state diode detection array. The final device may be configured either narrowly, for detection of specific chemical contaminants, or broadband, for survey of species present in the field. The fiberoptic device in immersible in a water source and the contaminants are detected as they diffuse into the sample compartment at the end of the fiber bundle. The scattered light signal is then carried by fiberoptics to the spectrometer at a convenient distance from the sample site.

In principle, any trace component that comes in the vicinity of the silver or gold microsphere surface will be detectable. This may not include all contaminants, but SERS has been shown to be an effective detector of organic pesticides (2). We expect that a range of organic contaminants in the environmental water supply may be amenable to this approach. The sensor system described above differs from alternative fiberoptic sensor systems, the so-called fiberoptic chemical sensor (FOCS) systems which rely on specific chemical coatings at the fiber tip to detect and identify contaminants in the vicinity of the sensor. The FOCS devices are sensitive and selective, but they are also limited to sensing one specific contaminant and are not recyclable. Our optical sensor system uses a spectral approach, fiberoptic spectral sensing (FOSS), a technique that provides the potential of sensing a range of chemically distinct contaminants with a single reusable device.

1.3.3.2 Photocatalytic Detoxification of Organic Pollutants Using Semiconductor Catalysts (N. N. Lichtin)

This research program is devoted to study of the mechanisms of photocatalysis that apply to degradation of organic pollutants in heterogenous contact with semiconductor particles (19). This approach employs oxidative mineralization of vaporized organic pollutants by the action of oxygen over solid catalysts (semiconductor materials such as finely divided anatase) under irradiation at wavelengths in the visible and/or ultraviolet (20). Examples of many classes of organic compounds have been shown to be mineralized under these conditions; C and H are converted, respectively, to carbon dioxide and water, while Cl and Br are converted to HCl and HBr. Compounds that have been shown to be effectively destroyed by photocatalytic means on irradiation of liquid aqueous TiO_2 slurries include Arochlor 1254, benzene, chloroform, EDTA, nitrotoluene, trichloroethylene (TCE), and phenols. The principal thrust of current research in the Lichtin group, in conjunction with research efforts carried out at ClearFlow, Inc., involves elucidation of the mechanism of amplification processes which lead to observed efficiencies in excess of 10 or even 100 molecules destroyed per incident photon in some reactions involving treatment of organic vapors. An attractive area for further faculty involvement relates to recent findings that large scale remediation of oil or fuel spills can be accomplished, with projections of economic viability, using TiO2 photocatalyst attached to glass microbeads (21).

1.3.3.3 Optical Materials and Spectroscopy for Atmospheric Sensing and Materials Fault Testing (S. Chakrabarti, A. Lempicki, D. Coker)

Photonic materials and devices will play a special role in military applications that involve remote sensing in the atmosphere. Of particular interest to our research programs is the development of new scintillation materials for the detection of (laser) light beams and ionizing radiation and the development of new detectors having high sensitivity or fast-response characteristics. For example, Professor Lempicki's work is focused on lanthana-doped crystalline materials that provide specialized scintillation properties for non-destrucive testing of aerospace components by gamma transmission tomography. The new materials under investigation provide an alternative to less rugged plastic scintillation detector materials and have suitably fast response characteristics. New detectors based on gamma irradiation (not x-ray) testing would be effective in detecting modes of material failure including corrosion, pitting, and stress-induced cracking. A major development currently under examination is the use of optical ceramics based on lanthana-doped yttria which have excellent properties in terms of capabilities to grow large, highly transparent, low-scattering crystals suitable for incorporation in light or gamma ray detectors.

The group led by Dr. Chakrabarti in the Center for Space Physics develops various imaging and spectroscopic instruments for probing the upper atmosphere and astrophysical sources. Their instruments feature ultraviolet detection for sensing and tracking. Applications include early warning sensors during boost and reentry phases of various missiles or for ranging of tactical weaponry. The work of this group also includes the development of optical coatings with emphasis on multilayer materials for detection in the Extreme Ultraviolet. Work in this area is evolving toward the development of integrated systems. Complete detection systems would include optics, detector and electronics integrated in a small sensor package. These packages (called BLISS - Boston Lightweight Imaging and Spectroscopic Systems) can be optimized, or customized, for particular applications and represent a novel combination of photonic materials and systems.

1.3.3.4 Environmental sensors based on immunochemical photonic materials (C.R. Cantor, C. Smith)

Detection of environmental toxins is an extraordinarily difficult problem, because they may exist in very tiny amounts, and these may be situated at discrete loci that represent a tiny fraction of the region of interest. Thus, an effective sampling technique must be combined with a very sensitive analytical method. Recent technological advances at BU are at the stage where they may be able to meet the challenge posed by ultrasensitive detection of chemical or biological warfare agents. Immuno-PCR can routinely detect single DNA molecules. Present formulations of immuno-PCR easily detect less than 600 antigen molecules via a fluorescent signal, and there is every reason to think that optimized formulations will have sensitivities of a few molecules. Every biological agent presents multiple potential targets for detection with monoclonal antibodies. Most chemical agents will form adducts with test molecules that are also detectable with monoclonal antibodies; some agents will be detectable directly. Thus immuno-PCR offers the possiblitly of testing for almost any agent of interest with very high specificity and exquisite sensitivity.

1.3.4. Supporting and Related Activities

1.3.4.1 Laboratory for Ultra-fast Spectroscopy

(L. Ziegler, G. Jones, S. Unlu)

The methodology for the study of material responses in the short time regime of 50 femtoseconds to picoseconds is well established(22). An initial ultrafast (pump) pulse excites electrons above the band-gap or into excited electronic levels and subsequent time delayed (probe) pulses monitor the evolution of the system and/or observe the return of the system to equilibrium. The study of nonequilibrium carriers is essential for an understanding of the electronic properties of semiconductors and the physics of semiconductor devices (23). Measurements of the detailed kinetics of electronic transport on the subpicosecond time scale as a function of doping, temperature and electric field are vitally important, in particular, to the understanding and development of both electronic and optical materials for high speed applications. The initial relaxation of dense electron-hole plasmas excited by optical pulses has been observed to occur on a 20-500 femtosecond time scale in some semiconductors (24). The subsequent charge carrier and hole dynamics are influenced by carrier-scattering processes such as coulombic and carrier-phonon/impurity interactions. Carrier recombination and hot carrier cooling rates have been found to occur on the subpicosecond and picosecond time scales (25). These carrier dynamics may be probed by a variety of femtosecond pulse pump-probe optical techniques such as transient dichroism (absorption) and birefringence, bleach recovery, stimulated emission, transient hole-burning, impulsive scattering, photon echo, spontaneous emission up-conversion and time resolved spontaneous Raman scattering. These techniques will be applied to the III-V nitrides, the major focus of work in Core Problem 1. Similar optical techniques will also be applied to the light sensitive biomaterials described above (section 1.3.2). The ability of such materials to operate as effective triggers or switches, as well as hosts for the storage of information, will depend directly on their short time or high frequency responses.

Femtosecond laser optical techniques can also be of great value for the measurement of performance characteristics of fabricated devices. The increase in speed of electro-optic devices (for example, MODFETs) often precludes direct electronic measurements of performance. Optoelectronic techniques based on ultrafast lasers avoids these difficulties since the measurement of subpicosecond responses are easily achievable. Additionally, these optical measurements are possible for a large dynamic range of signal amplitudes which is important to the activity of switching devices. Furthermore, in addition to providing a real time clock of the earliest events of physical and chemical processes initiated with light, femtosecond light pulse techniques may also offer the opportunity for controlling material responses. This manipulation of material responses may be accomplished by taking advantage of both the temporal and coherence characteristics of ultrafast optical radiation. The proposed ultrafast spectroscopic measurements will be performed with a Ti:sapphire laser-based oscillator and regenerative amplifier system. Pulses in the 700 - 900 nm regime of approximately 50 femtosecond duration are currently commercially available from Ti:sapphire oscillators. For time resolution in the sub 100 picosecond regime the delay between pump and probe pulses will be varied and controlled by standard optical path delay techniques (26)

The Laboratory for Ultra-fast Spectroscopy will be equipped to measure ultrafast responses by a variety of nonlinear spectroscopy techniques on time scales as short as ~ 50 femtoseconds. For example, time and frequency resolved transient pump-probe absorption/emission studies can directly monitor the electron hole dynamics in semiconducting materials or any optically accessible transients in the samples of interest (22). Pump-probe coherent time domain techniques such as optically heterodyned detected transient birefringence and dichroism measurements permit determinations of both the real and imaginary components of the complex nonlinear polarization response (27). Sensitivity in the accessible pulse spectrum range is excellent via these direct time-domain based measurements and does not require instrumental corrections as compared to conventional far-IR sourçes (27,28).

The subpicosecond relaxation of optically injected carriers dynamics will be observed as a function of defect densities, electric field strengths, photon energy, carrier density and temperature. These techniques are applicable to thin films as well as bulk solid, liquid and vapor samples. Other types of samples of interest here include particulate or colloidal photocatalytic heterojunction materials such as TiO_2, CdS and Ag halides (29). The determination of carrier relaxation and recombination rates will be important characterizations for their use in photographic diodes and transistors and for imaging and information storage. Other techniques that should provide information about the ultrafast dynamics of these photonic materials examine time-resolved spontaneous emission(30). Time resolved stokes and antistokes resonance Raman scattering may be used to monitor the time and phonon mode dependence of thermalization processes following optical excitation. Time resolved spontaneous fluorescence emission may be observed by nonlinear up-conversion techniques (31). The time dependence of the shape and center frequency of this luminescence may a particularly useful probe of optically excited dynamics when both ground and excited state responses contribute to the stimulated pump-probe signals. Only the excited state dynamics contributes to the spontaneous up-conversion experiments. Novel optical techniques for the control of material responses take advantage of the coherence effects due to the interaction of such short pulses with matter (32,33). Their extension to semiconducting and biophotonic materials may lead to more efficient optical pumping schemes, decreased laser damage thresholds in both bulk and thin layers, and enhanced nonlinear optical effects.

1.3.4.2 Laboratory for Systems Integration

(M. Ruane, F. Humphrey, and S. Unlu)

Systems integration involves assembling materials, devices, sub-systems, and components into functionally coherent systems for some application. The integration activity often centers around establishing accurate test data on the functionality and performance of individual components before they are added to the other parts of the system (34). In the Center, many individual research efforts will share a need for common measurement equipment and methods, particularly as various materials from the Program on Photonic Materials are incorporated into prototype devices. In the Program for Photonic Devices and Systems, activities like the high-capacity data networking initiative or the multimedia testbed will require immediate systems testing support. Another generic internal testing need is for validation of components that are being installed in a researcher's systems or instruments. Externally, measurements for industrial collaborators might be needed to verify standards of compliance of their prototypes, using IEEE, NIST, DoD MILSTD, EIA, CCITT or international standards bodies' procedures. The support Laboratory for Systems Integration will develop the equipment and measurement procedures for such testing.

The most elementary systems measurements begin with power levels, loss/gain in components, and attenuation, especially if fiber is involved. These require appropriate detectors, power meters or opto-electronic converters to an oscilloscope. If an entire fiber link or fiber-based device (e.g. fiber sensor or amplifier) is to be tested, for communications or instrumentation applications, a reflectometer would be required. It often is desirable, especially in sensors applications, to measure polarization dependent power and loss, or polarization conversion. Extinction ratios for selective devices can be measured. Spectral measurements indicate device output spectra, detector responsivity curves, and spectral loss dependence. Finer grain measurements can yield linewidths and modal structure information, as well as modulation effects on spectral characteristics. With this information system, wavelength windows can be identified for applications like WDM. Specific components like laser diodes might be examined for modulation effects like distortion, chirp, and jitter, extinction ratio, and losses. Their noise figure and Relative Intensity Noise (RIN) would also be measured and system performance predicted. Finally, high system level tests like eye-diagram analysis (to assess SNR, ISI and jitter) and BER testing (using a BER generator).

The Center's interest in wide band-gap materials, and lower wavelength research, will make the development of customized detectors necessary. While some such testing will naturally occur in the femto/picosecond test facilities, it is desirable to have compatibility with standard system bench equipment as integration proceeds. In addition to expanding spectral response range for our commercial instrumentation, we will also design and fabricate specific test apparatus. Attenuated total reflection (ATR) has been proposed for non-destructive testing of magnetic and semiconductor films (35); patents have been obtained for our modified ellipsometer for optically active materials(36), and standard and scanning Kerr hysteresis loop testers have been constructed (37).

1.4 Scientific Tasks - Program for Photonics Systems and Devices

1.4.1 Core Problem 4: Photonics Links Among Supercomputers

In the last decade databases and communications have benefited from orders of magnitude growth in processing and data transfer speeds. These advances have created networking capabilities in the low Gbps range and the need for storage materials and systems that approach several terabits per user or server. Such technological advances have changed the way in which data is stored and managed by DoD, industry, commercial users and individuals. Moreover very high bandwidth photonic links between computers have the potential to revolutionize parallel and distributed computing. The goal of integrating powerful supercomputers at remote locations is being pursued at the National level by the Gigabit test bed projects, sponsored by DARPA and NSF.

This Core Problem considers several aspects of the continuing evolution of DoD, industrial and commercial systems towards high Gbps and even Tbps architectures. In particular it will use forefront photonics technology to interconnect two powerful massively parallel supercomputers at remote sites, establishing a network of unprecedented bandwidth. Our efforts are directed towards enabling technologies, demonstrations and test beds that will facilitate substantial advances in performance in the next two to three years. Important defense advantages to be gained from the integration of distributed computers we are planning derive from improved redundancy and survivability of military computer systems. The distances that will be encompassed are such that the interconnections will be easy to replicate aboard even the largest aircraft carriers and battleships. Thus, it will be possible to distribute major computer resources on a large ship, making them much less vulnerable to attack, without forfeiting any of the increased computational performance which could be obtained by merging the same resources into a single supercomputer. This Core Problem will be a source of collaboration with industry and DoD researchers and it will further the goals of DoD and the High Performance Computing and Communication Initiative (38).

1.4.1.1 Very High-Speed Parallel Links Among Massively Parallel Supercomputers

The Boston University Center for Computational Science has been a pioneer in developing interdisciplinary applications of massively parallel supercomputers to research problems in science and engineering in an academic setting. Our unique position was established in 1988 when the University acquired a 32k processor Connection Machine CM-2 supercomputer for use by its researchers, reaffirmed by the creation of the Center for Computational Science in 1990, and recently continued with the addition of the latest CM-5 supercomputer, keeping our facilities on the leading edge. We have a wide range of ongoing research projects in parallel computer applications in science and engineering and this year we have begun to introduce parallel computing into our undergraduate curriculum, making Boston University a strong intellectual center for applications of parallel computing (39).

Massively parallel computers harness the power of a large number of tightly coupled CPU's working together in a highly coordinated fashion, to solve large problems rapidly. Distributed computer systems have generally consisted of separate computers linked together by a relatively low bandwidth network such as Ethernet and the links of the Internet. A very significant and currently accessible goal is to use photonic technology to construct a geographically distributed massively parallel supercomputer. The bandwidth -- on the order of hundreds of Gigabits/second -- between CPU's would be the same as though they were in the same cabinet, but would be supported by photonic technology. The network would be extended to other network routers and computing resources using a 1 Gigabit/second fiber network and eventually down to individual workstations at 100 Megabit/second. This leads to a system that couples the advantages of massively parallel supercomputers (the ability to solve grand challenge problems) to those of distributed systems (greater I/0 capabilities, scalability, local financing and support). Moreover, with redundant network links, a supercomputing complex based on geographically distributed units would be of great strategic value, being obviously much more impervious than a concentrated resource to catastrophe or hostile attack.

A project to establish such a geographically distributed massively parallel supercomputer in the Boston area has been recently formulated by a team of scientists from Boston University, Harvard University, M.I.T. and Thinking Machines Corporation. Named EPIC, for Extended Parallel Interconnect Computer, it would constitute the first implementation of metropolitan supercomputing, and would pave the way for the extension of highly-integrated distributed supercomputing at the national level.

We propose to exploit the new technologies, whose development will be fostered by the Boston University Center for Photonic Research, by constructing in the short-term powerful network links between the CM-5 supercomputers at the Boston University Center for Computational Science and Thinking Machines Corporation in Cambridge, MA and locally between computers at the Center for Computational Science, the new Photonics Research Center and the Office of Information Technology. The CM-5 to CM-5 link will serve as the prototype for the EPIC complex, which could be subsequently grown to encompass the metropolitan area. This network will provide a unique laboratory for developing and testing of photonic interconnection technologies, parallel algorithms for high performance computing, and will serve as a model for the extension of such technologies over different and wider geographical regions.

A natural property of the massively parallel architecture of the CM-5 is that multiple CM-5 systems can be interconnected to form a single, larger CM-5 system. Internally, the components of the CM-5 (processors, devices, etc.) intercommunicate via a tree structured network, having the communicating components as leaf nodes or addresses (40). A single cabinet of the CM-5 can contain up to 256 such addresses and a four-level tree. To build larger systems, multiple cabinets are interconnected topologically by creating higher levels of the tree and physically via thirty-foot cables containing multiple data channels. It is feasible to physically extend this interconnection by, in effect, "stretching" the thirty-foot cables several miles via fiber optic cables. Two basic components are needed to accomplish this. First, circuitry must be developed which, on one side, presents the same parallel interface as an interconnecting cable coming from another cabinet, and on the other side presents a multiplexed data stream for transmission to the remote location. This multiplexing circuitry must contain appropriate buffering, flow control and multiplexing components to allow each of the two or more interconnected systems to operate with the increased latencies associated with the greater physical distances and to minimize the number of required fibers by maximizing the use of the fiber bandwidth. This circuitry will be error detecting but not error correcting, consistent with the internal design of the CM-5. This component will be developed in collaboration with Thinking Machines Corporation.

The second component will be an "error free" photonic link which will tie together the multiplexors. This link must incorporate flow control, buffering, error detection and correction, and retransmission functions. Tradeoffs between error correction, retransmission and latency will have to be studied. Furthermore, it will be of paramount importance that we implement the optical link at the highest possible bandwidth in order to manage the number of fibers required. Using conventional 1Gbit links, for example, we will need 64 single mode fibers to connect our current 64 processor CM-5 to a similar machine at Thinking Machines Corporation. Bandwidth in the 10Gbit/s range should be available with the time frame of this proposal, thereby reducing the number of fibers required, or increasing processor interconnect capabilities.

Within the University, our CM-5 will in turn be connected to other computers on a local area fiber-based network using a variety of network hubs, routers, and switches. Current and emerging technologies offer a range of services and performance characteristics with speeds from 100 Megabit/ second on today's FDDI into the Gigabit/second range for fiber based (serial) HIPPI and ATM/Sonet networks to the hundreds of Gigabits/second connections to be used in our EPIC project. It is our goal to understand how a variety of applications, ranging from multimedia and video to grand challenge computing problems, can most effectively use each of these technologies, each with its own price/performance characteristics and, moreover, how various components and even differing technologies will operate in multi-vendor, heterogeneous networks.

1.4.2 Supporting and Related Activities

1.4.2.1 Systems for Multimedia and Novel Displays

Recent work in optical communications has led to successful long-haul multichannel fiber communications at rates in excess of 5 Gbit/s per channel. There are few applications that can exercise these capacities, even at the lower rates currently available from existing commercial switches. One application is the use of multimedia technology suitable for live packet-video communications, video-on-demand database services, and real-time data capture, correlation and dissemination. (41) We propose to develop a test bed for studying the application of very high-speed communications and very large storage services to distributed data environments and multimedia communications. To achieve this objective, we plan to obtain and install a 100 Gbyte optical storage server, an ATM-based switch, workstation interfaces and supporting fiber-optic cabling and installation to support both ongoing and new research in multimedia technology including development of communications protocols for communication bandwidth allocation, physical database organization for time-dependent data (e.g., video-on-demand service), conceptual database organization for massive heterogeneous data sets (e.g., satellite imagery), and human-computer interface design.

Coupled with existing University facilities, including the current CM-2 and CM-5 supercomputers, this research will lead to new developments in scalable distributed systems, data fusion and correlation, high-availability data storage, and dissemination of massive data sets. Furthermore, this system will be suitable for study of high-availability, fault-tolerant distributed systems, as the performance of optical communications effectively eliminates the distance of geographically separated computers. In anticipation of future telecommunications standards (SONET) (42), we have selected an ATM-based switching mechanism and interfaces. This equipment, in conjunction with our existing Unix workstations and the requested optical storage server, would provide a complete test bed for high-bandwidth research. We also anticipate interconnection to existing wide-area networks (e.g., AURORA) (43).

1.4.2.2 High Density Erasable Storage

Vertical Bloch Line (VBL) memory is a new data storage technology that offers the potential to store data at densities greater than 1 Gbit/cm2 in solid-state nonvolatile memory chips (44). Because VBL memories use magnetic garnet materials that exhibit the polarization-sensitive magnetic Faraday effect, laser and fiber optic systems become important in investigating and studying the microscopic structures that are key to the dynamic operation of these memories (45). Currently, laser microscopy, using polarized light, can be used to observe domain wall motion to determine the presence of VBLs. Laser stroboscopic microscopy at Boston University, under support from the Jet Propulsion Laboratory, is being used to study domain wall motion in VBL materials and VBL test devices. The laser microscope at Boston University, together with its real-time video image processing system, is capable of revealing displacements in magnetic structures to a precision of 30 nm and a temporal resolution of 10 ns using bright-field illumination. Enhancements to the laser microscopic system can be envisioned to extend the performance of the system for a variety of scientific investigations. The system could be modified to obtain high spatial precision and fine temporal resolution using dark-field illumination, in which contrast is obtained based on the direct scattering of polarized light by VBLs and domain walls (46,47).

While VBL chips are currently receiving most attention as magneto-electronic devices, because of the material's Faraday activity, it is possible to design magneto-optical and magneto-optoelectronic memory devices (48). Such devices could support high-density terabit memory structures, optical data processing, and highly parallel computational environments. The concepts would bring together the multiple disciplines of semiconductor lasers, solid state detectors, and magnetic storage materials. It becomes necessary to seek tunable and high output laser sources to match the optical characteristics of the slight sources and detectors with the magnetic materials. Precision coupling between each of the elements also becomes necessary.

Stroboscopic laser microscopy is in itself a powerful analysis tool. Advanced magneto-optical storage materials, that can be used in high performance magneto-optical disk drives, exhibit Faraday or Kerr effects (49). These materials, typically made of rare-earth transition metal alloys, can be studied at high spatial resolution to understand domain nucleation and stabilization processes.

1.5 Program for Photonics Communications, Management, and Training

Industrial collaborations, technology transfer, and training in photonics will be the responsibility of the Program for Photonics Communications, Management, and Training. These activities will have long-range impact on the continued health and competitiveness of the photonics industry, and form a crucial connection between Boston University and local firms and laboratories. During the initial period of DoD funding, methods for the development of self-sustaining support for the Center will be developed. Industry collaborations will play an important role in these efforts. Support will be sought through specific academic research proposals and joint research proposals with industrial partners (involving SBIR collaborations). A high likelihood exists for continuing support from the private sector, because of the high efficiency associated with shared facilties, access to first-class faculty and students, and the creation of newly trained employees in photonics. This program will also assist in the initiation and oversight of collaborative efforts with DoD and industry. Cooperation by corporate and DoD research personnel in discussions of academic program needs for photonics curricula and training will be important.

A *Photonics Advisory Board* will be established, with consultation with corporate and DoD laboratory sources. We expect to use guidelines from the Federal Technology Transfer Act of 1986 and models like the Engineering Centers of Excellence, NSF University-Government Consortia, and commercial collaborations like SEMATECH. Critical to the organization will be three elements: *establishment of balanced participation by large and small businesses, the University and by DoD* (at least one permanent Board position to be held by a DoD agency or laboratory representative); *creation of a self-sustaining program of research and innovation* by setting research and programmatic goals for both short- and long-term competitiveness in photonics; and *development of clear evaluation measures* to identify efficient and productive efforts that should be continued. Early efforts will also be needed to reach an agreement among the parties as to the allocation of patent rights regarding inventions made by affiliates of the Center.

1.5.1 Technology Transfer

Technology transfer activities will facilitate the dissemination of information, the sharing of resources, and the development of a skilled workforce for photonics products and services. The Center will become a clearinghouse for photonics-related initiatives on science, technology, and innovation. Through traditional and electronic means we will collect and make available the generic research base for photonics, for use particularly by regional companies and laboratories. Already the Boston area boasts a strong base for the distribution of research findings, but it is fractured and distributed across many universities, laboratories, and company libraries. Working with our Science and Engineering Library, we will improve public access to scientific and technological advances in the photonics industry.

The Center will also conduct its own seminars, meetings, and short courses, and will create other dissemination methods for DoD personnel and companies interested in photonics. As an example of possible innovative instruments for broadening the information base, the Center will provide information over the University's interactive microwave TV system, *Corporate Classroom*, an established vehicle for reaching local industry, creating a video record, and publicizing Center activities. Other novel dissemination vehicles, like CD-ROM, bulletin boards, and video short courses will be explored.

1.5.2 Photonics Resource Facilities

Access to existing on-campus facilities and the new facilities of the Center will be valuable to researchers and engineers in the region. Small business will benefit especially through access to expensive or rare equipment and facilities. Technical assistance and advisory services would be made available to participants to ensure increases in productivity, the expansion of employment and the improvement of economic competitiveness for the industry.

The geographical location of the Center is ideal. Located in the technical, educational, and financial 'hub' of the New England region, Boston University will be able to serve the needs of industry and academic colleagues with minimal travel. Related facilities, including the National Magnet Lab, the Massachusetts Microelectronics Center, Hanscom AFB/Rome Labs, Natick ARL, the Coast Guard Research Labs (in Groton), and organizations such as MITRE and Lincoln Laboratory, are all within an hour or two of campus. The Route 128 area is, of course, a center for high technology and defense industries.

1.5.3 Education and Training

The presence of the Center will encourage curricular innovation in photonics at both the undergraduate and graduate level. Visiting positions will be supported by the Center to allow research and training appointments in the Center's laboratories and with specific faculty. Such visiting appointments infuse valuable pragmatic industrial and commercial perspectives into the Center They also offer the visiting scientist or engineer an opportunity to interact with faculty and students, and to be trained on the Center's state-of-the art facilities. The proposed budget supports two initial Visiting Scientist and Senior Research Associate positions.

Curriculum development in photonics is already underway, but would be accelerated by Center activities and opportunities for students. Undergraduate curricula in our engineering programs have been evolving to reflect the increasing importance of photonics, especially opto-electronics, lasers, and novel materials. Specific technical undergraduate electives and graduate courses addressing photonics include:

SC563	Fiber Optic Communications
SC565	Electromagnetic Energy Transmission
SC570	Lasers and Applications
SC577	Solid State Devices
SC770	Statistical Mechanics for Materials Science
SC771	GaAs Materials and Devices

In Physics, a new four-course sequence is being prepared in Modern Materials, and in the Department of Chemistry, an undergraduate course in biomaterials and biosensors will be developed.

The National Science Foundation has recently provided support to the University to develop the first undergraduate curriculum in parallel computation, using the supercomputer resources of the Center for Computational Science. The program results from a collaboration of engineering, mathematics, and science faculty. Evidence of other recent recognition of teaching excellence includes the award of three 1992 NSF Research

Experiences for Undergraduates (REU) grants (Advanced Engineering Materials, Modeling and Control of Engineering Systems, and Advanced Methods in Electrical Engineering). Other recent awards include two separate Department of Education Graduate Research Applied to National Needs fellowship programs (in ECS, for thin films, electromagnetics, signal processing and software engineering; and in Manufacturing, for process control, materials, and simulation). The NSF has also supported our Engineering Professional Practice Program for high-achieving undergraduates and graduates who spend nine months in an industry placement.

Boston University has been a leader in the development of innovative media for technical education. Several hundred professional engineers register for graduate engineering courses each semester through our Corporate Classroom. A dedicated microwave link connects two live on-campus classroom studios to about 35 industrial sites in Eastern Massachusetts and New Hampshire. A new technology, PictureTel's two-way interactive compressed video, is being used to reach United Technology Corporation sites in Connecticut over standard telephone lines. These video links contribute to our strong industry ties, and also create a new means for access to training in photonics technology and innovation. At the graduate level, a further interaction exists between the sciences and engineering departments through the Division of Engineering and Applied Science. DEAS administers all engineering and applied science programs (M.A. in Applied Physics, Ph.D. in Chemistry or Engineering), bringing faculty together for Ph.D. program policy discussions, graduate financial aid, and the assignment of teaching and research assistantships.

1.6 Other Facilities Supporting the Photonics Center

Computational Analysis and Simulation Lab (CASL)

A focal point for application of high performance computers to engineering and scientific problems, CASL studies the electromagnetics of biological systems, simulations of magnetic materials, protein engineering, and parallel algorithms.

Integrated Circuit Fabrication Laboratory

Research in this lab is aimed at gaining a fundamental understanding of the processes involved in the manufacture of integrated circuits. That knowledge is used to model fabrication processes and fabricate innovative device structures.

Magnetic and Optical Devices Laboratory

Properties and applications of magnetic and magneto-optical materials are studied using optical and other methods in MODL. Current work emphasizes Bloch lines and their application to magnetic storage, the fabrication and characterization of magneto-optic thin films for sensors, and optical characterization of semiconductors.

Microelectronics Research Laboratory

This laboratory is involved in research and development of analog and digital systems and instruments for scientific application. Current MRL grants from MIT/NASA and DARPA address deep space and ocean floor sensor systems.

Molecular Beam Epitaxy Laboratory

MBE lab research engineers fabricate novel electronic materials by molecular-beam epitaxy and other high vacuum processes. Gallium arsenide, gallium nitride, diamond, and layered materials are being developed. Additional clean room and sputtering facilities support the MBE efforts.

Nonlinear Modeling Laboratory

Devoted to the study and modeling of deterministic and stochastic nonlinear processes, this lab investigates techniques for adaptive filtering of nonlinear and chaotic signals. Applications include data communications, channel equalization, chaotic phenomena, and financial option systems.

Sensors, Actuators, and Micromechanics Laboratory

Clean room fabrication facilities in this lab are used to develop silicon sensors and actuators with integrated electronics. Silicon machining and piezoelectric sensor materials are integrated to create tactile sensors, strain gauges, micropumps for drug delivery, and autonomous mobile "silicon ants" (microrobots).

Very Large Scale Integration (VLSI) Research Laboratory

This group is concerned with the computer-aided design of VLSI computer chips. Members of this group use state-of-the-art computer automated design and simulation tools to develop digital and analog circuits. Fabrication occurs through affiliation with the Massachusetts Microelectronics Research Center.

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2.0 Boston University

2.1 Principal Faculty

Associate Professor Yaneer Bar-Yam [Electrical Engineering]

Materials Growth Modeling
Professor Bar-Yam is a theoretician who uses abstract cellular automata to calculate ab initio models of materials growth. His methods have been applied to both structured and disordered materials, and provide us with a view of the motion and interaction of defects, atoms at interfaces, and surface properties. In conjunction with experimentalists in the department, Professor Bar-Yam has been studying the controlled growth of electronic, optical, and tribological materials.

Assistant Professor Thomas Bifano [Mechanical Engineering]

Ultra-precision Grinding of Ceramic Optical Components
A fixed abrasive grinding system with 20 nm tolerances and sub-nanometer surface roughness has been developed by Professor Bifano, using interferometric positioning feedback and feed control (rather than cutting surface control). This work is supported by Oak Ridge National Lab's SDI Optics Program, NASA, and NSF. The grinding system uses extensive optical feedback, and requires optical characterization of finished pieces to evaluate the specifications and tolerances of the resulting ceramic optics.

Professor Charles Cantor [Biomedical Engineering]

Biomolecular Design and Fabrication
Professor Cantor works in the preparation and characterization of novel biomaterials. His ultimate goal is the creation of biomaterial-directed nanoengineering allowing precise interactions between computers and cells. His research will lead to molecules, and ultimately devices, that will exploit computer-controlled arrangement of molecular scale structures.

Professor Supriya Chakrabarti [Astronomy, Center for Space Physics]

Astronomical Imaging and Spectroscopic Instruments
Professor Chakrabarti's group develops various imaging and spectroscopic instruments for probing the upper atmosphere and astrophysical sources. These same instruments have been used for DoD applications involving sensing and tracking. Research activities also include the development of low-light-level detectors and the study of photo-sensitive materials for use with photon counting imaging detectors using microchannel plate (MCP) technology.

Associate Professor Kaighan (Ken) Gabriel [Electrical Engineering]

Micro-Mechanical Actuators for Adaptive Optics
Professor Gabriel (on leave 1992-93 at the Naval Research Laboratory) is collaborating with Prof. Bifano to use semiconductor photolithographic methods to create a massively parallel array of surface-normal actuators, each of which can mechanically deform a mirrored overcoat layer serving as the face sheet. The processing of the actuators is based on existing micro actuator technology that evolved from silicon machining and piezoelectric actuators. The photolithographic methods allow rapid

customization of actuator dimensions, placement, and deformation of the face sheet. The work has attracted interest from Litton-ITEK Optical Systems, and is related to addressable deformable AO devices from another local firm, Optron Systems, Inc.

Assistant Professor Bennett B. Goldberg [Physics]

Optical and Electronic Properties of Reduced Dimensional Systems

Professor Goldberg's work in optical and electronic processes in reduced-dimensional semiconductors is utilizing the technique of Near-Field Scanning Optical Microscopy (NFSOM) to measure the emission and absorption spectra of single quantum dots and nanostructures. His research includes the design and fabrication of narrow quantum wires in GaAs for use as self-locking far-infrared detectors. Work in other semiconductor systems includes nanostructures in IV-VI PbTe thin films.

Professor Morton Hoffman [Chemistry]

Chromophore Transformations Within Solid Supports

Professor Hoffman is a physical-inorganic chemist with extensive experience in the photochemistry and photophysics of transition metal coordination complexes, and the reactions of free and coordinated phototransient species. His work includes the investigation of photosynthetic systems as well as mechanisms of electron and energy transfer. Recently, one aspect of his research is directed toward the encapsulation of metal complexes within the cages of zeolites. Because of the close proximity of the species within the solid, the molecular transformations occur in very short timeframes potentially suitable for optical information storage.

Research Professor Floyd Humphrey [Electrical Engineering]

High-speed Laser Stroboscopic Microscopy of Vertical Bloch Lines

Professor Humphrey, who has received the IEEE Magnetics Society Medal, is a leader in the use of transmission laser flash photography for materials characterization. His system, which has been replicated at JPL, involves a pulsed dye laser system whose imaging pulses are delivered to a polarization microscope/video frame grabber system. The laser light illuminates thin films of garnet materials which contain magnetic domains. The domain walls contain twists, called vertical Bloch lines, that hold promise for data storage.

Professor Guilford Jones [Chemistry]

Dye Laser Materials, Fluorescent Sensors and Biopolymer Molecular Wires

Professor Jones is a photochemist with expertise in the development of new dye laser media, artificial photosynthesis, and biopolymers for molecular electronic or opto-electronic applications. His work includes investigation of organic dyes solubilized in polymer media and the effects of polymer environment on dye photophysical properties and the service life of dye materials under conditions of laser irradiation. These investigations also include the development of fluorescent or Raman spectroscopic sensors for the detection of chemical agents or pollutants. Other projects are focused on the design and synthesis of "molecular wires" in which charge is transported under photoexcitation within biopolymer domains (synthetic peptides having one-dimensional geometries).

Professor Norman Lichtin [Chemistry]

Photocatalytic Decomposition of Pollutants

Professor Lichtin is a physical chemist involved in light-induced oxidative decomposition of organic compounds supplied in aqueous solution or as a vapor to a metal oxide solid (catalytic) surface. Work is carried out both at Boston University and at Project Sunrise, corporation supported by the B.U. Community Technology Foundation, where Professor Lichtin is Chief Scientist.

Assistant Professor Karl F. Ludwig, Jr. [Physics]

X-ray Scattering and Phase Transitions

Ludwig's research uses x-ray diffraction to study kinetic processes in materials and thin film structure. Time-resolved x-ray diffraction on the subsecond time scale is being used to understand the kinetics of crystallization and other phase transitions in metals and polymers and, more recently, the kinetics of the bacteriorhodopsin photocycle. X-ray diffraction studies are examining GaN and Hi-Tc thin films to elucidate the relationship between atomic structure and the films' electronic and optical properties.

Professor Theodore Moustakas [Electrical Engineering]

Development of III-V Nitrides for Optical Devices

In his MBE laboratory, Prof. Moustakas is developing the family of III-V Nitrides for optical devices in the blue and ultraviolet region of the electromagnetic spectrum. Such devices include LED's, lasers, and light detectors. These materials are also optimized for electronic applications for high temperature, high frequency, and high power devices. The MBE laboratory is equipped with facilities for the growth of films by Electron Cyclotron Resonance-Assisted MBE, CVD processes, and sputtering and clean room facilities for device processing. Additionally, the laboratory is equipped with experimental aparata for thin film and device characterization measurements (Hall effect, photoluminescence, C-V measurement, etc.).

Professor Claudio Rebbi [Physics, Center for Computational Science]

Advanced Computational Methods

As Director of the Center for Computational Science, Professor Rebbi investigates highly parallel computations for theoretical and applied physics. He has developed simulation and multigrid techniques for field theory, particle theory and solutions in quantum field theory. The Center for Computational Science has been selected by NSF to develop a curriculum for parallel computation in science and engineering.

Professor Kenneth Rothschild [Physics] (with Professor G. Jones, Chemistry)

Biophysical and Genetic Methods for Photonics Materials Development

Professor Rothschild is a biophysicist studying energy transduction, signal-transduction and proton transport in membrane proteins. His laboratory has introduced several FTIR based methods for studying biological molecules which are widely used. A recently funded collaboration by Professor Rothschild, is initiating work on proteins engineered for device-like characteristics. The project involves a merger of the techniques associated with biophysical probes of protein structure and function, fast time-resolved photochemical methods, and molecular genetics. The goals include the synthesis of protein mutants that have been modified in a systematic way to alter (tailor) the properties of membrane proteins (e.g., bacteriorhodopsin) that are capable of charge transport or energy transduction. The engineered proteins are to be potentially deployed in media for optical recording, biosensors, or in nanometer lithography.

Associate Professor Michael Ruane [Electrical Engineering]

Magneto-Optical Materials and Devices

Professor Ruane, in the Magnetic and Optical Devices lab, conducts experimental work on amorphous thin films of rare earth-transition metal alloys for commercial erasable optical media, sensors and optical switching. The films can be sputtered and etched like semiconductor films, and thermomagnetically written using scanned IR laser beams, creating complex magnetic structures with unique sensing and diffraction effects. Other efforts in the lab are working on optical characterization, including a collaboration at Hanscom/Rome Lab in multilayer characterization by attenuated total reflection (ATR).

Professor William Skocpol [Physics]

High T_C Superconductivity and Semiconductor Transport

Professor Skocpol's current research program emphasizes high temperature superconducting thin films, ranging from basic dissipative properties to microwave circuit applications. He is also beginning to work with wide-bandgap-gap semiconductors for optical and electronic devices.

Assistant Professor Kevin E. Smith [Physics]

Electronic and Structural Properties of Novel Materials

Professor Smith seeks to understand experimentally how electronic structure determines the optical, electrical, structural, and chemical properties of novel materials. A powerful array of electron and photon spectroscopic probes are used to measure the previously undetermined bulk and surface electronic structure of a selection of unusual compounds. Current research is focused on the determination of electronic structure in single crystal thin film wide band gap semiconductors, measurement of quasi-low dimensional Fermi surfaces in low dimensional conductors, and construction of a high resolution soft x-ray fluorescence spectrometer to study defects and dopants in insulating oxides and wide band gap semiconductors.

Associate Professor Jan Smits [Electrical Engineering]

Piezoelectric Micro-sensors and Micro-actuators

Using the semiconductor fabrication facilities of the ECS Department, Professor Smits works on the design and fabrication of etched silicon and piezoelectric devices. These include silicon beams and diaphragms, especially with over deposited PZT films, that served as electro-mechanical sensors and actuators. When fabricated with reflective films, these devices show promise as high speed resonant beam steerers for lasers. His work has attracted strong industry interest in micro-sensors, and autonomous micro-robots.

Professor Lawrence Sulak [Physics]

High-energy Physics - Particke Detector Research
Current work is in Superconducting Super Collider (SSC) detector research and development, focusing on calorimetry using arrays of scintillating optical fibers for particle identification and energy measurement. Principle Investigator at Boston University in the IBM Proton Decay experiment and co-discoverer of neutrinos from Supernova SN-1987A. Participant in the MACRO experiment at Gran Sasso, Italy and the Muon g-2 experiment at Brookhaven National Laboratory.

Assistant Professor Selim Unlu [Electrical Engineering]

Compound Semiconductor Devices, Photodetectors; Simulation of Optoelectronic Devices
Professor Unlu's research involves the design, simulation, processing, and characterization of novel semiconductor structures. Emphasis is placed on photodetectors in compound semiconductors utilizing layered structures. Computer simulation is directed towards predicting the transient response of photoelectronic devices. A model to solve the device equations using a circuit simulator has been developed.

Professor Lawrence Ziegler [Chemistry]

Ultrafast Phototransient Dynamics in the Femtosecond Time Domain
Professor Lawrence Ziegler provides expertise in the area of laser light scattering and ultrafast chemical dynamics. He has previously pioneered the area of Raman scattering in the ultraviolet region and has more recently developed light scattering techniques, using continuous sources, that determine ultrafast processes of photochemical dissociations. Such studies show how the processes of chemical bonds breaking which occur on a subpicosecond (femtosecond) timescale depend on electronic, vibrational and rotational degrees of freedom. His most recent work theoretically describes some novel ultrafast laser techniques.

2.2 Associated Faculty

Associate Professor Hassan Ahmed [Electrical Engineering]

Communications, Nonlinear Filtering and Channel Equalization
While in industry, Professor Ahmed pioneered the development and VLSI implementation of lattice algorithms for high-speed modems. More recently he has investigated adaptive nonlinear filtering algorithms for signal processing and channel equalization. Nonlinear algorithms should be important tools for designing analog and ultra high speed optical communication channels and devices, especially where nonlinearities must be exploited, as in soliton communications. A related effort is considering asynchronous transfer mode (ATM) communication of multimedia data over optical LANs, to address FDDI shortcomings for multimedia applications.

Assistant Professor S. Basu [Mechanical Engineering]

Analysis and control of interfaces in photonic, tribologic, and electronic films
Professor Basu is a specialist in the relationships among processing environment, film structure, and materials properties for tribological, electronic, and photonic thin films. He has worked extensively on the analysis and control of interfaces, especially at metal/ceramic and ceramic/ceramic boundaries. His work on superconductor

microstructure, high temperature coatings, and rapid solidification has used TEM, HREM, EDX, EELS, SEM, RBS and XRD.

Professor Richard Brower [Computer Engineering, Physics]

Massively Parallel Computations for Materials Science

Using the CM-5 (Connection Machine) massively parallel computer, Professor Brower addresses theoretical and algorithmic problems related to nucleation, growth and stability of domains in metastable or quasi stable regimes. These problems have application to magnetic, magneto-optical, and semiconductor growth and equilibrium phenomena. In work performed for the Naval Underwater Warfare Center, Professor Brower applied parallel algorithms to sonar image reconstruction.

Associate Professor David Castanon [Systems Engineering]

Data Fusion and Adaptive Optics

Arrays and systems of optical and other detectors are important elements of SDI, undersea surveillance; and terrestrial battle management. Professor Castanon, with nearly 15 years of industrial systems experience at Alphatech, applies modern control and systems theory to defining the most effective and efficient integration of data from such systems. In an Alphatech SBIR, Professor Castanon and his student are applying optimal control theory to the dynamics of a deformable mirror for adaptive optics.

Professor Bernard Chasan [Physics]

Membrane Structure and Electrical Properties

Spectroscopic techniques including FTIR are being used to study the secondary structure of the Band 4.5 protein which mediates glucose transport across the red cell membrane. Measurements of electrical activity in membrane proteins such as bacteriorhodopsin are investigated by incorporating these proteins into artificial membranes. The structure of mucin, a complex assembly of proteins and sugars, is being studied with infrared spectroscopy. This work is in collaboration with the gastrointestinal department at the B.U. Medical Center.

Assistant Professor David Coker [Chemistry] (with Research Professor A. Lempicki)

Frequency Domain Optical Data Storage

Professor Coker is a theoretical chemist who uses both classical statistical mechanical methods and quantum theory for solution to "many-body" problems. Applications of these modern theories include the development of models of the dynamical response of liquid or solid materials under photoexcitation. Professor Lempicki is an experimentalist who specializes in the study of photochromic or luminescent solids including glasses and ceramics. Coker and Lempicki are presently collaborating on a project directed to the development of new materials for optical data storage. The project involves both experimental work on photochemical hole burning in solids or crystals and theoretical approaches directed to an understanding of photoexcitation dynamics and electron mobilities in appropriate model systems.

Assistant Professor Scott Dunham [Electrical Engineering]

Defect Migration during Er^{++} Doping of Silicon

Professor Dunham works on modeling and controlling defect generation and migration during doping processes in silicon. These models have been helpful for improving semiconductor uniformity and performance and have received Sematech support. These same defect mechanisms are believed to play a role in the diffusion of rare earths in silicon for creating optically active materials. Potential applications are improved fiber lasers and fiber amplifiers.

Assistant Professor Joshua Etkin [Computer Engineering]

Network Management and Distributed Computing

In the Modern Communications Laboratory, Professor Etkin studies data communications management using simulation methods. The increasingly high data rates of optical systems make management more critical, and motivate much of Professor Etkin's work on systems level constraints and the efficient use of the low-level physical layer where photonic technology now resides. His simulation methods can help address issues like the systems level benefits of investment in photonic switching and network control.

Assistant Professor Michael Gevelber [Manufacturing Engineering]

Process Control for Materials Manufacturing

Professor Gevelber's research focuses on modeling and control of CVD, MBE, and sputtering systems for the flexible manufacturing of photonic and electronic devices. His in situ systems seek to expand processing capabilities and to improve process performance. His students come from mechanical, electrical, and manufacturing engineering since his work covers modeling, control design and implementation, and process optimization.

Associate Professor Roscoe Giles [Computer Engineering]

Micro-structure Modeling of Magneto-Optical Thin Films

Professor Giles, with colleagues from the University of Arizona's Optical Sciences Center, has led the development of massively parallel simulations of micro-structural phenomena related to domain nucleation, growth, and energetics in magnetic materials. Most of his work has dealt with rare earth-transition metal amorphous alloys for erasable optical data storage media, with continuing support from IBM. Dealing with length scales of nanometers and time scales of nanoseconds and less, Professor Giles simulations have successfully reproduced the variety of domain structures observed in magneto-optical thin films.

Associate Professor Robert Hohlfeld [Electrical Engineering]

Inversion of Optical and Infrared Sensing Data

Professor Hohlfeld has made a significant contribution to the theory of inverting nonlinear systems to yield parameters from the underlying structure. His differential inversion technique is much less sensitive to the initial parameter estimates than previous methods. It has been used successfully on satellite atmospheric vertical sensing data, and is well suited to any problems involving a line-of-sight data set, e.g., atmospheric laser sensing for aerosol or gaseous pollutant concentrations.

Associate Professor Mark Horenstein [Electrical Engineering]

Electrostatics and Electronic Materials

Primarily an experimentalist, Professor Horenstein has worked on a wide variety of electrostatic problems, including spacecraft plasma sheath charging and its impact on solar arrays, laser printing/xerography, and, most recently, parachute electrostatics. This work is often combined with his electronics background, as in his Air Force contracts for an untethered sensor for space shuttle charging effects, or his SBIR collaborations with Spire Corporation on novel thin film pyroelectrics.

Associate Professor Allyn Hubbard [Computer Engineering, Biomedical Engineering]
(with Associate Professor D. Mountain)

Fiberoptic Motion Sensors for Biomedical Applications
Professors Hubbard and Mountain have been leaders in understanding and modeling the dynamics and signal processing properties of the human auditory system. As part of their experimental work on cats, and as a possible human diagnostic device, they have recently developed a fiber optic based motion sensor. Using the small size of an optical fiber, their device performs low coherence tomography of the moving eardrum and provides information on mechanical resonances and stiffness that is useful for modeling of auditory dynamics and diagnosis of ear diseases or injury.

Research Professor Boris Levy [Chemistry]

Particulate Heterojunction Photocatalysts
Professor Levy is a specialist in silver emulsion photography, photoconducting materials, and the mechanisms of photogeneration of charge carriers in thin films. One effort examines charge separation at "heterojunctions" forged by derivatization of a colloidal or particulate photoconducting material such as TiO_2. Another involves new photocatalysts for degrading pollutant organics such as halocarbons. Time-resolved photocharge and microwave conductivity measurement techniques are used, with applications for imaging and photovoltaic properties of new materials.

Assistant Professor Thomas D. C. Little [Systems Engineering]

Multimedia Data Communications and Software Design
High bandwidth communications applications will include multimedia, which impose demanding constraints for data continuity and real-time performance. Professor Little's lab conducts research on effective compression of multimedia, data communications protocols, and software development for multimedia systems. The work bridges computer engineering, computer science, and software engineering, with a strong connection to photonic systems implementation of full motion video.

Associate Professor Anton Mavretic [Electrical Engineering]

Optical Communication of Sensor Information
Professor Mavretic's Laboratory for Analog VLSI has contributed to the development of several high performance communication and sensing systems. He has worked mostly for NASA, on the Jupiter probes, the soon-to-be-launched WIND experiment for measuring the solar wind, and several atmospheric balloon systems. He brings extensive analog electronics experience and is a leader in analog VLSI development. Currently he is part of a deep ocean sensor team, where he has helped design the fiber optic link from seabed sensors back to the Hawaiian islands.

Associate Professor Ali Nadim [Mechanical Engineering]

Sonoluminescence

Under large ultrasonic excitation of fluids, synchronous cavitation occurs and bubbles are trapped at the nodes of the standing acoustic field. These bubbles exhibit visible flashes of light with durations of 50 to 100 ps, called sonoluminescence. Professor Nadim is studying the spherical shock waves inside the bubbles as an explanatory mechanism for superheating the trapped gases until they emit visible light.

Assistant Professor Raymond Nagem [Mechanical Engineering]

Chiral Fluid Measurements

Professor Nagem's interest in fluid mechanics requires methods to measure localized and distributed turbulent flows. In addition to standard laser measurements of turbulence, he has been developing a polarization-based laser measurement method that applies to chiral fluids (that rotate polarization). Since various substances can be added to fluids to create chirality, and polarization sensors are easily constructed, this method opens new measurement techniques for fluids research.

Associate Professor David Perreault [Computer Engineering]

Data Communications and Systems

Professor Perreault has a long-standing effort with Rome Lab in the area of hardware and software design for distributed and secure data networks. This effort is important because of its systems level implications for the requirements of photonics hardware in data networks.

Associate Professor Vinod Sarin [Manufacturing Engineering]

CVD of Thin Films

Professor Sarin has created a small scale experimental CVD system for studying the physics and control of deposition. His research involves both theoretical and experimental investigation of CVD for tribological, electronic, and optical applications. Working with manufacturing students, his research provides a practical link to commercialization problems involved in bringing research results to industry.

Professor Cassandra Smith [Biomedical Engineering]

Biomolecular Design and Fabrication

Professor Smith's group uses novel materials to purify and characterize DNA molecules, especially large molecules up to mm in length. By hybridization based on polyamide nucleic acid (PNA) at lowered temperatures, she is working to avoid the labor-intensive and unreliable conventional hybridization steps that can damage larger DNA molecules. Such techniques offer the potential for creating long DNA based molecular structures that are a basis for biomolecular nanoengineering.

Professor Richard Vidale [Systems/Software Engineering]

Embedded Systems Software Design and Performance

Professor Vidale's research is involved with modeling distributed real-time systems, using Petri nets to verify behavioral correctness and predict performance. Applications have included efforts with Draper Labs in the area of Ada program verification. Many likely applications of photonic systems will involve real-time embedded software for control, switching and monitoring, for instance in the area of real-time displays and human interfaces. Prof. Vidale manages the Embedded Systems Laboratory of our Software Engineering Corporate Associates Program for graduate software engineering.

Assistant Professor Donald Wroblewski [Mechanical Engineering]

Optical Techniques for Flow Visualization and Measurement

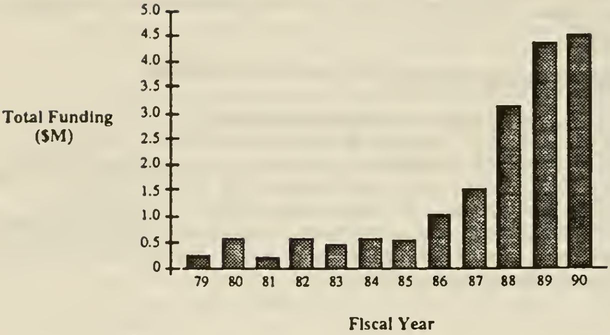
Professor Wroblewski's main research is experimental studies of complex flow fields. With NSF and Whitaker Foundation support, he is investigating periodically unsteady turbulent flows, which arise in both engineering and biological (pulmonary) flows. He has developed techniques for simultaneous temperature and velocity measurements in periodic flows, and is interested in optical methods for turbulent transport measurements. Chiral fluid measurements from multiple fiber probes is of special interest, especially in unsteady flows.

3.0 New Faculty

Successful implementation of the goals and programs of the Center for Photonics Research requires the recruitment of leading experts to faculty positions at Boston University. These new investigators will reflect the broad scope of photonics research and its applications, and add significantly to the mix of faculty presently in place. The current plan encompasses the hiring of a minimum of five new faculty with tenure or tenure-track standing, within a total of eight new faculty positions to be filled during the three-year grant period.

Recent recruitment and growth in research:

Since the establishment of the Metcalf Center for Science and Engineering in 1985, Boston University has been exceedingly successful in recruiting top notch researchers as evidenced by the growth in the sciences engineering over the past eight years. Boston University currently ranks 47th in the nation among academic institutions in federal obligations for research and development as reported by the NSF in 1990. Over the past eight years, growth in external funding has shown an increase of 54 per cent. Science and engineering departments have attracted over 30 new faculty in the past six years with Ph.D. enrollments increasing over 100% in that time, to over 250 students. Among objective measures of the overall research quality of the sciences and engineering, ten of our new faculty hold recognition awards, including 5 Sloan Fellowships, 3 NSF PYI grants, 1 DOE OJI grant, 1 C. B. Luce Fellowship. Boston University was ranked 7th nationally in the number of citations per journal article in the physical sciences (January 3, 1991 issue of Nature), and the research citation list has quintupled since 1985, with a paper published each working day. Annualized extramural Physics funding in FY90 dollars totalled $4.75M in 1990, up from $0.68M in 1985 (note Figure below), while Engineering funding grew in that period from $1M to $6M. Funding per faculty member has increased approximately five-fold. The number of prestigious awards won by Ph. D. graduate students has increased substantially from two in 1982-83 to fourteen in 1991-92. These facts attest to the ability of Boston University to attract the best researchers available.



Physics Department External Funding
(Corrected to FY90 dollars with CPI 82/84)

Plan for excellence in faculty recruitment:

The search for faculty to be recruited to the Center will be broad based and include advertisements in scientific publications such as *Photonics Spectra, Physics Today, IEEE Spectrum, Science, and Chemical and Engineering News.* Contacts with prominent faculty and leading industrial researchers around the world will also be effective in attracting leading candidates. A detailed assessment of candidates will be made based upon research accomplishments, standing in the international community, and an evaluation of the merit and competitiveness of specific research proposals. The ability to interact with industry will also be given serious consideration. A select group of Candidates will be interviewed with external input from the Photonics Center Advisory Board. Substantial startup commitments for incoming faculty are planned to attract the best candidates and to insure that they will be quickly productive.

Targeted areas of recruitment:

Boston University will recruit faculty specialists representing major sectors for photonics development, whose expertise will serve as a guide for development in areas not sufficiently represented by current staff. Among those areas identified are optical bistability and non-linear optics of novel materials, optical biosensors and environmental photoscience, optical manufacturing and engineering, and optical communications and switching. In all, Boston University is committed to hiring a minimum of eight new faculty in the three year grant period. Incorporated in the plan also is the recruitment of a distinguished researcher for the position of Project Director.

4.0 Budget Information

In the start-up phase, the Center will utilize existing facilities at Boston University in the University's science and engineering complex, which includes the Metcalf Center for Science and Engineering, the Engineering Research Building, and the Biology and Physics Research Buildings. Because these facilities are dedicated to other research programs and operate at nearly full capacity, it is essential that the Center for Photonics

Research be provided with its own facility as soon as possible. Moreover, some of the research and other activities which the Center is designed to undertake cannot be accomplished without new specialized facilities. A major portion of the funds appropriated by Congress for the Center is intended to support the construction of an appropriate facility. The Center for Photonics Research will be located in the heart of the Boston University science and engineering complex, at the corner of Commonwealth Avenue and Hinsdale Street, adjacent to the Physics and Biological Research Buildings, and a block from the Metcalf Science Center and the College of Engineering

4.1 Budget Justification and Supporting Information

The proposed budget provides for 100% of salaries for the Project Director and Associate Director, along with 50% of salaries and accompanying fringe benefits for eight new faculty (described above). Partial support for eight existing faculty who would support the major Center objectives in its formative years is also requested. This latter group would have the immediate task of coordinating efforts and participation in the development of new courses and curricula, the establishment of a graduate program related to photonics and the recruitment and training of graduate or undergraduate students. Related tasks associated with this core support group include the establishment of a seminar series, a short course program in photonics, and interaction with the Advisory Board consultants. A Senior Research Associate and a Visiting Scientist would be senior individuals who would provide additional expertise on a rotating basis to bring ideas and perspective from corporate affiliates, DOD labs, or other academic institutions. The budget also requests funding for full-time permanent staff (technician and engineer positions), one each to serve in laboratories for biomaterials, semiconductor materials, integrated systems, ultrafast measurements, and the high-speed supercomputing networks. The Center will also require a full time secretary and an administrative associate, whose primary responsibility would include facilities management, financial planning, and corporate and Advisory Board liaison.

The Center will evolve as a continual resource for corporate affiliates or DoD and other laboratories that might not have access to the complete array of synthetic, analytical, and fabrication equipment needed for development of their devices and products. The budget summary provides a brief listing of equipment, according to the relationship with particular missions or Center laboratories. Further documentation is provided here regarding items of equipment planned for purchase.

The major pieces of equipment for the laboratory for wide band-gap semiconductor development are a chamber for the growth of thin films, heterojunctions, and quantum wells in III-V nitrides, expressly dedicated for device fabrication. Other equipment for this sector includes a photoemission spectrometer and electron diffraction apparatus for the investigation of the bulk semiconductor and interfacial band structure, and an optical sputter coating facility for anti-reflection coating of devices. The laboratory for ultrafast measurements requires complete femtosecond and picosecond time-resolved pump-probe systems based on mode-locked Ti:sapphire laser equipment, Ar-ion pump laser, a regenerative amplifier, and cavity dumper and controlling electronics. A similar instrumental arrangement of laser pumped laser irradiation of wide band-gap systems is also requested that would provide optimal power and resolution in the picosecond-nanosecond time domain. A variety of optical components including elements for frequency doubling/tripling, pulse compression and beam steering are also required. The laboratory for environmental monitoring will provide the base analytical service laboratory for steady state measurements of fluorescence and other spectrophotometric techniques. Gel permeation and other chromatographic equipment and monochromator -

quantum counter apparatus will provide monitoring capabilities for a wide range of analytes (known pollutants and test samples under photodegradation conditions).

The items requested for the biomolecular materials laboratory would provide facilities necessary for the production of photonic biomolecules and materials produced form these molecules using advanced techniques in microbiology, and molecular biology. Specific capabilites for the proposed facility would include cell culture, genetic engineering, protein isolation and biomaterials preparation. Specific pieces of equipment requested for this laboratory include ultracentrifuges, a cell fermentor, and a "smart" protein isolation system. For the Integrated Systems activity, an optical test and measurement station is required, along with optical time-domain and precision reflectometers. Other components requested include polarization, lightwave component and portable lightwave signal analyzers. Work stations of the type, SGI Crimson Elan R 4000 (5 units), are necessary to provide state of the art graphics capabilites for molecular modeling, systems simulation, and device failure analysis.

Central to the operation of the Laboratory for High-speed Optical Comunications is the design, fabrication, and testing of a massively parallel fiber link between two Connection Machines. The ultra-high performance of the EPIC project's 288 Gigabit/sec fiber network will be used in creating a geographically distributed supercomputer. New equipment required for this project includes network electronics and switches, city-to-city fiber optic cabling, computer and router interfaces, engineering design and development. Other elements of required equipment under Optical Communications include a multimedia networking testbed facility.

Consumables required for the Center include chemicals, gases, paper products, office supplies, associated with all three of our programs, materials, devices, and information and training. Other operating costs or services include instrument and hard- and software leases or service contracts, publication, and photocopy expenses. Travel and meeting costs are associated with trips to meetings for the Photonics Advisory Board, seminar speakers, local and domestic travel for professional meetings, regional contacts in industry and education and training seminars. Consultant costs include payments to at least ten individuals (Advisory Board) @ $400/day for five days each per year, inclusive of 8.2% benefits, and additional consultant days associated with legal or patent services associated with technology transfer initiatives.

University Cost Sharing

Boston University will commit to formal cost-sharing, amounting to $16,000,000 to match the Defense Department facilities funding. This cost sharing will be directly related to building costs and the value of the land. The University will also provide other program enhancements such as partial faculty salaries, start-up investments in equipment for new faculty, furnishings for the Center, and tuition remission for the graduate students who will be fully supported by the program.

4.2 Photonics Center Three-year Budget Summary

	Year I	Year II	Year III
A. *Personnel*			
1. Project Director	135,000	140,400	146,016
2. Associate Director	72,000	74,880	77,875
3. Senior faculty (science) (2) (50% of time)	----	72,000	77,875
4. Junior faculty (science) (2) (50% of time)	42,000	43,680	45,427
5. Senior faculty (engineering) (50% of time)	----	37,440	38,938
6. Junior faculty (engineering) (2) (50% of time)	45,000	46,800	48,672
7. Senior faculty (communications) (50% of time)		33,800	35,152
8. Senior faculty (3) (1.0 summ mon)	23,976	24,935	25,932
9. Junior faculty (3) (1.0 summ mon)	13,846	14,400	14,976
10. Senior faculty (1) (20%, acad yr)	14,400	14,976	15,575
11. Junior faculty (1) (20%, acad yr)	9,000	9,360	9,734
12. Senior Research Associate	----	60,000	64,896
13. Visiting Scientist (50% of time)	----	36,400	37,856
14. Biomaterials Technician	----	36,400	37,856
15. Laboratory Engineer	35,000	36,400	37,856
16. Electronics Technician	35,000	36,400	37,856
17. Laser/optics Technician	35,000	36,400	37,856
18. Computer Resources Technician	45,000	46,800	48,672
19. Administrative Associate	40,000	41,600	43,264
20. Secretary	25,000	25,750	26,523
21. Graduate students	96,000	133,120	171,392
22. Undergraduate students	18,750	19,313	19,892
Total salary/wages	684,972	1,026,534	1,100,091
Fringe benefits	159,753	245,415	255,170
Total salary/benefits	844,725	1,271,949	1,355,261

B. *Equipment*

1. Laboratory for Wide Band-Gap Semiconductor Materials

Materials fabrication chamber	350,000	150,000	---
Scanning optical/atomic force microscopy facility	178,500	---	---
Photoemission spect. facility	180,000	---	---
Optical fabrication/coating facility	---	185,000	---

2. Laboratory for Ultra-fast Spectroscopy

Femto-picosecond laser facility	325,000	150,000	---
Optical detection systems	232,600	---	---
Vibrational spectroscopy facility	---	180,000	---
Time resolved x-ray facility	---	---	90,000
---			

3. Laboratory for Environmental Sensing and Photocatalysis

Analytical spectrometry and and chromatography facility	70,000	95,000	---
Quasi-elastic light scattering facility	---	---	45,000

4. Laboratory for Biomolecular Materials

Ultracentrifuge/fermenter/DNA synthesizer facilities	----	342,000	95,000

5. Laboratory for Systems Integration

Optical machining/metrology lab	150,000	---	---
Systems testing/measurements facility	---	200,000	200,000
Computer simulation/theoret. analysis	---	120,000	80,000

6. Laboratory for Ultra-High Capacity Networking and Storage

Interfaces/fiber optic links	1,126,648	---	---
Multimedia networking/test bed fac.	120,000	100,000	---

Total equipment	2,732,748	1,522,000	510,000
Total equipment (Years I - III)			4,764,748

C. *Travel*	107,800	112,112	116,596
D. *Consultant costs*	71,410	74,266	77,237
E. *Consumables and services*	299,140	311,106	323,550
F. *Meetings and conferences*	16,100	16,744	17,414
G. *Construction*	16,000,000	---	---
Total direct costs	20,071,923	3,308,177	2,400,058
Indirect costs	830,289	1,161,015	1,228,538
Total cost	20,902,212	4,469,192	3,628,596
Total funds requested (Years I-III)			$29,000,000

Cost-sharing by Boston University

	Year I	Year II	Year III
Formal Cost-sharing:	$ 16,000,000	---	---
Building construction	11,000,000	---	---
Real Estate	5,000,000	---	---

Appendix A: Supporting Documentation: Corporate and Laboratory Contacts

The following are excerpts from responses received from New England companies and laboratories.

"Boston University has a number of internationally recognized faculty members working in important areas of photonic research. They have made timely and significant contributions to the field and they have expanded the general knowledge base in photonics. A Photonic Center would add additional synergy to their work, and it would provide a convenient and efficient means for interacting with local industry."

Robert B. Lauer
Director of Technical Program Development
GTE Laboratories, Inc.

"We believe that such a consortium would make a significant contribution toward making New England a center of academic and manufacturing excellence in photonic materials, devices and systems. Photonic devices and systems are expected to be the cornerstone of the next generation of computer and communications technology."

Dr. Robert C. Linares
President
Linares Management Associates, Inc.

"MTL is a small business interested in advanced optoelectronics, electronic materials, solar photovoltaic equipment, and biomaterials. MTL's ongoing involvement in photonic research and that of the Consortium will provide cross-fertilization between industry and academia that will be beneficial for all."

Ta-Ming Fang
President
MTL, Inc.

"...the Consortium will be very valuable to the technology-oriented industries of the New England region, among which Raytheon, and I would expect frequent and intense interchanges, once the Consortium is established, with Faculty and students."

Mario D. Grossi
Submarine Signal Division
Raytheon

"As a leading supplier of equipment to emerging telecommunications service providers, we perceive an urgent need to participate in the impending creation of a new broadband telecommunications infrastructure. Photonics technologies included in the Consortium proposal represent fundamental building blocks in the establishment of such an infrastructure."

Mark A. Tubinis
Vice President, Engineering
Summa Four, Inc.

"Spire Corporation would welcome the establishment of the proposed New England Consortium for Photonics Research at Boston University and would expect to be an active industrial member when the Consortium is formed. I believe that the Consortium will be highly valuable to Spire and other technologically oriented businesses in the New England area, through its proposed facilities, intellectual resources, and students."

Roger G. Little
President and CEO
Spire Corporation

"NZ Applied Technologies is a high technology startup, with a strong focus on novel optoelectronic and electro-optic device technologies for military and civilian applications. We have chosen to locate in the metropolitan Boston area due to the 'mother lode' of educational and technical resources here. This decision is based on the belief that the interactive opportunities afforded by these resources are necessary nutrients for the growth of startup companies like NZAT. If anything is clear in this chaotic election year, it is the consensus that small business will play a dominant role in the job creation needed to propel the region from its economic doldrums. I would add that the teaming of small 'high tech' businesses, with universities constitutes an especially potent combination."

Dr. Peter E. Norris
President
NZ Applied Technologies

"OPTRON SYSTEMS, INC. strongly supports the establishment of the proposed Consortium for Photonics Research at Boston University and would welcome the opportunity to participate in the Consortium as an active industrial member. We believe that such an endeavor is much needed and long overdue in the New England area. Such a center would be invaluable in providing a focal point of coordination and collaboration for the many New England industries with active programs in the area of photonics."

Dr. James E. Hubbard, Jr.
Vice President
Optron Systems, Inc.

"Our company is involved in the development and production of ultraprecision machine tools for optical fabrication, a commercial arena in which we are the world leader. I think that the Boston Un iversity proposal represents an outstanding scientific and technical initiative. Siting the Photonics Center at Boston University will permit New England optics companies to gain a powerful competitive advantage in this emerging technology. Such a cooperative research venture will have a significant impact on the U.S. photonics industry, and will also help to move some exciting technology to the marketplace."

John B. Byrd, III
President
Rank Taylor Hobson, Inc.

"We would like to strongly encourage the establishment of a Photonics Center at Boston University. Photonics and opto-electronics are critical technologies to the future of the United States because the success of many industries will depend on it. The establishment of a Photonics Center at Boston university will undoubtedly help our competitive position through important university/industry collaboration. The meshing of the more product focus of the industry with the longer term university research will greatly enhance the effectiveness of the work from both sides."

Neville Lee, Ph. D.
Technical Program Manager
Optical Storage Products
Digital Equipment Corporation

"This letter supports the proposal of a photonics center led by Boston University and associated with government and commercial research and development in this area. The Phillips Laboratory, Geophysics Directorate, located at Hanscom Air Force Base, is involved in the use and development of ultraviolet technology. In this work, we have developed and are using calibration methods, measurement techniques, and complete sensors. We recognize limitations in current sensors, and we would be interested in becoming associated with research aimed at improving the situation."

Robert E. Huffman, Ph.D.
Supervisory Physical Scientist
Ionospheric Modeling and Remote Sensing Branch
Phillips Laboratory (AFSC), Hanscom AFB

"We are very encouraged by your efforts to establish a Center for Photonics Research in the Boston area. In its conceptualization it would provide a forum that would be widely beneficial to many in defense, educational, and industrial activities, and specifically, would have potential benefit to companies such as Foxboro. Foxboro being engaged in the sensing, control, and general automation of manufacturing processes througout industry relies on the successful migration of basic and applied research into successful commercial products. We see a large potential for photonics research leading to productivity and safety enhancing products in the industrial area."

Richard L. MacAllister Vice President Corporate Marketing The Foxboro Company	Ernoe Csaky Vice President Corporate Technology

"This letter gives Hughes Danbury Optical Systems, Inc. (HDOS) unqualified support for the New England Consortium for Photonics Research being proposed by Boston University to the U. S. Department of Defense. We share your belief that photonic technology will remain a key component of a strong U. S. defense posture in the foreseeable future. We also agree that photonic technology can provide a keystone to a national strategy to develop marketable consumer products to help rebuild our economy in the 1990's. HDOS has been a leader in U. S. photonic technology for more than three decades, providing precision engineering and manufacturing capabilities to the DoD and NASA under a great variety of governmnent sponsored programs."

Dr. Prasad R. Akkapeddi
Director of Research
Hughes Danbury Optical Systems, Inc.

"Photonics -- the integration of optical and electronics technology -- is at the core of our business. Our company expects to be a national leader in both the innovation of integrated solid state photonics devices and the development of optoelectronics manufacturing capability. Establishment of the Photonics Center at Boston University will provide an unparalleled resource for our company and for other related area businesses."

Richard H. Clarke
President
Boston Advanced Technologies

"Project Sunrise is a small business developing and applying new technology for the destruction of hazardous pollutants in air and water. Our technology uses "photocatalysis" and is accordingly based on photonic science. More specifically, much of the technology upon which Project Sunrise is based resulted from research performed in Boston University's Chemistry Department. We expect that the Center for Photonics Research can provide an efficient vehicle for broad scientific and technological support of Project Sunrise's business activities and look forward to the development of a productive relationship between the Center and our company."

Elliot Berman
President
ClearFlow, Inc.

"Raytheon's Equipment Development Laboratories would like to encourage the development of Photonic's Research Center at Boston University. Ongoing research in photonics and optoelectronics technologies is critical to both defense system improvements and commercial product development. Strategic radar systems and communication networks are employing more optoelectronic subsystems to meet growing performance requirements while simultaneously reducing weight and volume. The improvements in photonics and optoelectronics technology derived from a central research center with long-term objectives would complement the near-term development effort of numerous firms in Eastern Massachusetts. The proximity of the local industrial effort to this research center will create a natural and effective bonding of university research and industrial applications. This would directly benefit our defense industries and provide a technical fallout for the commercial sector as well."

Paul J. Tanzi
Manager, Communications Systems Laboratory
Raytheon Company

"We enthusiastically endorse your project to interconnect by fiber optics links Boston University's 64-node Connection machine CM-5 with a comparable CM-5 at Thinking Machines Corporation in the context of Boston University's Center for Photonics Research. Our scientists have studied such project in great detail. It would implement communications between supercomputers at an unprecedented bandwidth and would break entirely new ground in tightly-integrated, distributed supercomputing. While nothing so ambitious has ever been attempted before, we are convinced that the project is within reach of present technological capabilities, although these would be pushed to the limit. Its success would open dramatic new opportunities for very high performance, distributed supercomputing at the national level. Since so much of the project relies on advanced fiber optics communications technology, Boston University's Center for Photonics Research would constitute an ideal setting for its realization."

Harvey L. Weiss
Vice President
Thinking Machines Corporation

Appendix B: Faculty Participants' Vitae

Faculty Participants: Department of Chemistry

Name: MORTON Z. HOFFMAN, Professor, Department of Chemistry

Education:
A.B. (cum Laude), Hunter College of the City University of New York (major in chemistry, minor in physics and mathematics), 1955
M.S. in Chemistry, University of Michigan, 1957
Ph.D. in Chemistry, University of Michigan, 1960

Employment:

1960-1961	Postdoctoral Research Associate, University of Sheffield, UK
1961-1967	Assistant Professor of Chemistry, Boston University
1967-1971	Associate Professor of Chemistry, Boston University
1971-	Professor of Chemistry, Boston University

Distinctions:
Fellow, American Association for the Advancement of Science, 1992
Visiting Scholar, University of Michigan-Flint, 1979
Senior Postdoctoral Research Assoc., U.S. National Academy of Sci., 1969-70

Research Interests:
Photophysics and photochemistry of transition metal coordination complexes
Photochemistry of ion-pair electron donor-acceptor complexes
Electron-transfer reactions of excited states and fast kinetics techniques

Selected Bibliography: Total papers published: 165

1. H. Sun, G. Neshvad and M.Z. Hoffman, (1991) "Energy Gap Dependence of the Cage Escape Yields from the Sacrificial Reductive Quenching of Ru(II)-Diimine Photosensitizers in Aqueous Solution," Molec. Cryst. Liqu. Cryst., 194, 141-150.

2. M. Venturi, Q.G. Mulazzani, M. D'Angelantonio, M. Ciano and M.Z. Hoffman, (1991) "Radiation-Induced Electron-Transfer Processes in Ru(II)-Diimine Complexes in Aqueous Solution. An Application of Marcus Electron-Transfer Theory. " Radiat. Phys. Chem., 37, 449-456.

3. T. Ohno, A. Yoshimura, D.R. Prasad and M.Z. Hoffman, (1991) "A Weak ag0-Dependence of Back Electron Transfer within the Geminate Redox Pairs Formed in the Quenching of Excited Ru(II) Complexes by Methylviologen." J. Phys. Chem., 95, 4723-4728.

4. M. Venturi, M. D'Angelantonio, M. Ciano, Q.G. Mulazzani and M.Z. Hoffman, (1991) "One-Electron Reduction of Ru(II)-Diimine Complexes. Characterization of Reduced Species Containing 2,2'-Bipyridine, 2,2'-Bipyrazine, and 2,2'-Bipyrimidine in Aqueous Solution," J. Phys. Chem., 95, 5121-5129.

5. M. Georgopoulos and M.Z. Hoffman, (1991) "Cage Escape Yields in the Quenching of $^{*}Ru(bpy)_3{}^{2+}$ by Methylviologen, Presence of Triethanolamine as a Sacrificial Electron Donor in Aqueous Solution." J. Phys. Chem., 95, 7717-7721.

Name: GUILFORD JONES Professor, Department of Chemistry

Education:
B.S., Rhodes College, 1965
Ph.D., University of Wisconsin, 1970

Employment:

1969-71	Postdoctoral Fellow, Yale University
1971-77	Assistant Professor, Boston University
1977-82	Associate Professor, Boston University
1982-	Professor, Boston University

Administrative Positions at Boston University:

1989–	Chairman, Department of Chemistry
1984-86	Associate Chairman, Department of Chemistry
1985-88	Chairman, Biotechnology Program Committee

Distinctions: NIH Postdoctoral Fellow, NIH Predoctoral Fellow
Co-Chairman, U. S. - Japan Information Exchange Seminar: Organic Photochemistry: Molecular Energy Storage, Sendai, Japan, 1986
U.S. Patents: 2

Research Interests:
Organic and polymer photochemistry; photophysics and photodegradation of laser dyes; photoactive biomaterials; photoeffects associated with organic dyes and polymers

Selected Bibliography: Total papers published: 98

1. G. Jones, II, W.R. Bergmark and W.R. Jackson, (1984) "Products of Photodegradation for Coumarin Laser Dyes," Optics Communications, 50, 320-324.
2. G. Jones, II and C. Weiss (1989) " Dye Binding to Polytryptophan and Lysine-tryptophan Copolyer: Electron Transfer Quenching by Biopolymer Pendant Groups," in Molecular Electonics, Biosensors, and Biocomputers. F. T. Hong, ed. Plenum, New York, 1989.
3. G. Jones, II, C. Oh and K. Goswami (1991) "The Photochemistry of Triarylmethane Dyes Bound to Polylectrolytes: Photoinduced Electron Transfer Involving Bound Dye Monomers and Dimers," J. Photochem. Photobiol. A: Chem., 57, 65–80.
4. G. Jones, II and B. Huang, (1992) "Photoactive Peptides: Development of a Redox Catalytic Triad for Sulfide Oxidation Based on Poly-L-histidine," J. Phys. Chem., 96, 9100.
5. G. Jones, II and M.A. Rahman (1993) "Photophysics of Laser Dyes Bound to Poly(methacrylic acid) in Water," Optics Communications, 97, 140.

Name: ALEXANDER LEMPICKI, Research Professor, Dept. of Chemistry, 1983-
Research Professor, Dept. of Physics, 1989-

Education: B.S., Imperial College of Science and Technology, London, 1949
M.S., Imperial College of Science and Technology, London, 1952
Ph.D., University of London, 1960, (Physics)

Employment:

1989-	Alem Associates, Sole Proprietor, R/D & Consulting on Luminescence, Laser Materials, Optical Spectroscopy, Scintillators.
1983-85	Optical Diagnostics Systems Inc. Boston, MA, Chairman and founder of the company devoted to research, development and manufacture of systems for medical radiology.
1983-87	Consultant, Corning Glass Works, R&D Division, Luminescent Solar Collectors, Luminescent Glass Ceramics.
1983	Consultant, Baxter Travenol, Clinical Assays Division, Luminescent assays.
1955-83	GTE Laboratories Inc., Manager of Quantum Electronics Dept. and later Electro-Optics Laboratory, Government Technology Center.
1969-72	Consultant to NASA, Office of Advanced Research and Technology.

Distinctions: Fellow, American Physical Society, Fellow, Optical Society of America
Fifteen US Patents

Research Interests:
Optical properties of solids; Optical spectroscopy: Luminescence; Laser materials; Ionizing radiation detectors; Scintillators. Organometallic complexes of Rare Earths and the development of the first liquid state laser. Nonlinear light scattering from liquids. Luminescent glass ceramics.

Selected Bibliography:

1. A. Lempicki and Cz. Koepke, (1991) "Electronic Photochromism: Case Study of Bismuth Germanate," J. Luminescence, 47, 227.

2. A. Lempicki and Cz. Koepke, (1990) "Excited State Photochromism in Bismuth Germanate," Chem. Phys. Lett. 172-224.

3. A. Lempicki and A.J. Wojtowicz, (1989) "Luminescence of Cr^{3+} in Sillimanite," Phys. Rev., B39, 8695-8701.

4. A. Lempicki and A.J. Wojtowicz (1988) "Luminescence of Cr^{3+} in Mullite Transparent Glass-ceramics," J. Luminescence, 39, 189-203.

5. A. Lempicki, A.J. Wojtowicz, W. Meng, G.H. Beall, D.W. Hall and T. Chin, (1988) "Spectroscopic Characteristics of Cr Doped Glass-ceramics," IEEE J. Quant. Electr., 24, 1109.

Name: BORIS LEVY, Research Professor, Department of Chemistry

Education:
B.S., New York University, 1948
Ph.D., New York University, 1955

Employment:

1950-51	Scientist, Sylvania Electric Co.
1955-56	Senior Scientist, RCA Corporation
1956-60	Senior Scientist, Westinghouse Electric Co.
1960-65	Senior Scientist, Mobil Oil Co.
1965-89	Manager, Imaging Materials Re&D Polaroid Corporation

Research Interests:

Time resolved opto-electronic investigations of charge carrier dynamics and separation in inorganic semiconductors; photocatalytic heterojunction materials; imaging materials and devices; photovoltaic materials; naturally occuring polymeric photoconductors and non-linear optical materials.

Selected Bibliography:

1. B. Levy, (1991) "Heterojunction Models for Chemical, Spectral and Supersensitization of AgX by Sulfur, Gold and Sensitizing Dye," J. Soc. Photogr. Sci. Technol. Japan, 54, 477.

2. B. Levy, "Heterojunctions in Imaging and Photocatalytic Systems, in Proceedings of the Symposium on Electronic and Ionic Properties of Silver Halides," eds. B. Levy, L. Slifkin, J. Deaton, A. Muenter, T. Tani, I. Leubner and P. Kamat, St. Paul, MN, IS&T, Springfield, VA., pp. 189-197.

3. B. Levy, (1991) "Photocatalytic and Photographic Heterojunctions, in Photochemical Conversion and Storage of Solar Energy," eds., E. Pelizzetti and M Schiavello, Kluwer Acad. Publ., Netherlands, pp 337-392.

4. B. Levy and C. Rippon, Epitaxial Photographic Diode and Transistor Heterojunctions: Systems Containing Silver Halide," Proc. Intern. East-West Symp. II; Oct. 30-Nov. 4, 1988; Kona, Hawaii, pp. F44-48.

5. C. Rippon and B. Levy, "Kinetics of Silver Cluster Formation and Trapped Hole Neutralization in Silver Halide Emuylsion Grains Digested with Cadmium Salts," Photogr. Sci., Engr. 27, 65.

Name: NORMAN N. LICHTIN, University Professor and Professor of Chemistry, Department of Chemistry

Education:
B.S. with Distinction in Chemistry, Antioch College, 1944
M.S. in Chemistry, Purdue University, 1945
Ph.D. in Physical-Organic Chemistry, Harvard University, 1948

Biographica

1989-	Cofounder of Synlize, Inc. (renamed Project Sunrise in 1990)
1990-	Chief Scientist, Project Sunrise, Inc.
1947-	Boston University faculty member,
1973-	University Professor
1961-	Professor of Chemistry
1983-87	Director, Division of Engineering and Applied Science
1973-84	Chairman, Department of Chemistry

1980-86	Consultant, ARCO Solar, Inc.
1976-	Assoc. Editor for Photochem., Solar Energy

Distinctions: Coochbehar Lecturer, Indian Assoc. for Cultivation of Science, Calcutta, 1980.
NSF Senior Postdoctoral Fellow, 1062-63.
Arthur Lehman Fellow, Harvard University, 1947-48

Research Interests:

Organic and polymer photochemistry; photophysics and photodegradation of laser dyes; photoactive biomaterials; photoeffects associated with organic dyes and polymers.

Selected Bibliography:

1. N.N. Lichtin, J. Dong and K.M. Vijayakumar, (1992) "Photopromoted TiO2-Catalyzed Oxidative Decomposition of Organic Pollutants in Water and in the Vapor Phase," Water Poll. Res. J. Canada, 27, 203-10.

2. N.N. Lichtin, K.M. Vijayakumar and J. Dong, "Photopromoted Method for Decomposing Oxides of Nitrogen into Environmentally Compatible Products," U.S. Patent No. 4,980,040, issued Dec. 25, 1990.

3. N.N. Lichtin and K.M. Vijayakumar, "Method for Making Ammonia by the Reduction of Molecular Nitrogen," U.S.Patent No. 4,891,202, issued Jan. 2, 1990.

4. N.N. Lichtin, R.C. Svrluga and T.M. DiMauro, "Catalytic Process for Degradation of Organic Materials in Aqueous and Organic Fluids to Produce Environmentally Compatible Products," U.S.Patent No. 4,861,484, issued Aug. 29, 1989.

Name: LAWRENCE ZIEGLER, Associate Professor, Department of Chemistry

Education: B.S., SUNY at Stony Brook, 1971
M.S., Cornell University, 1974
Ph.D., Cornell University, 1978

Employment:	1971-73	Teaching Assistant, Cornell University
	1973-78	Research Assistant, Cornell University
	1978	Postdoctoral Research Associate, Cornell University
	1979-81	Postdoctoral Research Associate, Stanford University of Oregon
	1981-83	Research Associate, Naval Research Lab
	1983-88	Assistant Professor, Northeastern University
	1988-92	Associate Professor, Northeastern University
	1992-	Associate Professor, Boston University

Research Interests:

The application and development of ultrafast laser techniques for the study of short-time material responses. The study of dynamics on the femtosecond time scale can be accomplished either directly in the time domain or in the frequency domain via resonance light scattering techniques.

Selected Bibliography:

1. N.F. Scherer, L.D Ziegler and G.R. Fleming, (1992) "Heterodyne-Detected Time-domain Measurements of I_2 Predissociation and Vibrational Dynamics in Solution," J. Chem. Phys., 96, 5544.

2. N.F. Scherer, A. Matro, L.D. Ziegler, M. Du, R.J. Carlson, J.A. Cina and G.R. Fleming, (1992) "Fluorescence-Detected Wave Packet Interferometry. II. Role of Rotations and Determinations of the Susceptibility," J. Chem. Phys., 96, 4180.

3. M. Cho, S.J. Rosenthal, N.F. Scherer, L.D. Ziegler and G.R. Fleming, (1992) "Ultrafast Solvent Dynamics: Connection Between Time Resolved Flourescence and Optical Kerr Measurements," J. Chem. Phys., 96, 5033.

4. L.D. Ziegler and N.F. Scherer, (1992) "A Nonlinear Polarization Description of Phase-Locked Pulse-Pair Spectroscopy," J. Chem. Phys., 97, 4704.

Faculty Participants: Department of Physics

Name: RAMA BANSIL, Associate Professor, Department of Physics

Education:
B.Sc.(Honors in Physics), University of Delhi, 1967
M.Sc., in Physics, University of Delhi, 1969
Ph.D., in Physics, University of Rochester, 1975

Employment:
Vinton Hayes Fellow in Applied Physics, Division of Engineering and Applied Physics at Harvard University, Oct. 1974-Sept. 75
Research Associate, Harvard-MIT Program in Health Sciences and Technology, MIT, Cambridge, MA Oct. 1975-Sept. 1976
Assistant Professor of Physics, Boston University,
Associate Professor of Physics, Boston University, 1984 - present

Distinctions:
Science Talent Scholarship, N.C.E.R.T. India, 1964-1969
Vintou Hayes Fellowship, Harvard University, Postdoc toral Research, 1974-75
Whitaker Health Sciences Fund Award, for MIT-BU collaboration, 1978-1980
American Cancer society Junior Faculty Award, 1979-1982
Member, NIH special Study Sections, Sept.81, Nov.81, Feb.82
Member, NSF Presidential Young Investigator award Review Panel, Dec. 90

Research Interests:

Application of laser light scattering techniques to study polymer gels, diffusion and micro-phase separation in polymer gels. This work is of direct relevance to the use of gels for developing optical memory devices.

Selected Bibliography: 51 papers, 36 contributed talks, 34 invited seminars

1 G. I. Nishio, J.C. Reina and R. Bansil, (1986) "Quasi-elastic light scattering study of the movement of particles in gels," Phys. Rev. Lett. 59, 684.

2. J.C. Reina, R. Bansil and C. Konak, (1990) "Dynamics of probe diffusion in gels," Polymer,31,1038.

3. Bansil, S. Pajevic and C. Konak, (1990) "Diffusion of polystyrene in gels," Macromolecules, 23, 3380.

4. R. Bansil, J. Lal and B. Carvalho, (1992) "Effects of gelation on kinetics of spinodal decomposition in gelatin" Polymer, 33, 2961.5

5. G.F. Mallamace, N. Micali, C. Vasi, R. Bansil, S. Pajevic, S. and F. Sciortino, (1992) "Micro-phase separation in cross-linked gels: Depolarized light-scattering results," J. Colloid and Polymer Sci., 89.

Name: BERNARD CHASEN, Professor, Department of Physics

Education:	A.B.,	Columbia University 1955
	Ph.D.,	Cornell University (Experimental High Energy Physics) 1961

Employment:	1961-62	Assistant Professor, Harpur College SUNY
	1962-68	Assistant Professor, Boston University
	1978	Sabbatical leave, Harvard Medical School
	1968-82	Associate Professor, Boston University
	1987	Sabbatical leave, MIT Laser Biomedical Research Center
	1982 -	Professor of Physics, Boston University

Distinctions:
Associate Chair, Physics, 1988 85-86, 82-83.
Interim Chair, Physics, 1983-85
Director of Undergraduate Studies in Physics Department, 1989 -
Director of Outside Users Group, MIT Bates Linear Accelerator, 1977-78

Research Interests:

Incorporation of bacteriorhodopsin into bilayers and study of protein transport; membrane proteins studied by infrared spectroscopy and neutron diffraction; interaction of methane with micelles and vesicles studied by dynamical light scattering; Brillouin spectroscopy of proteins.

Selected Bibliography:

1. B. Chasan, H. Batliwala, L. Makowski and D. English, (1992) "An FTIR Study of M13 Coat Protein Structure in Lipid Bilayers," Biophysical Journal, **81**, no2, part 2, p 91A.
2. B. Chasan, M. Kenyon and K.J. Rothschild, (1988) "Lanthanum Inhibition of Bacteriorhodopsin Proton Pumping in a Planar Bilayer," Biophysical Journal, **53**, no. 2, part 2, p. 382A.
3. B. Chasan, A.K. Solomon, (1985) " The Reflection Coefficient of Urea in the Red Cell," BBA, **821**, p56.
4. B. Chasan, A.K. Solomon, M. Sukacovic and M. Toon, (1984) "Effect of Thiourea on pCMBS Inhibition of Osmotic Water Transport in Human Red Cells," BBA, **778**, p185.

Name: BENNETT B. GOLDBERG, Assistant Professor, Department of Physics

Education:
B.A., Harvard University, Physics, 1982
M.S., Brown University, Physics, 1984
Ph.D., Brown University, Physics, 1987

Employment:
1989 - Assistant Professor, Department of Physics, Boston University
1989 - Visiting Scientist, MIT, Francis Bitter National Magnet Lab
1986 -88 Bantrell Postdoctoral Fellow, MIT, Department of Physics

Distinctions:
Alfred P. Sloan Fellow, 1991
NSF Presidential Young Investigator, 1991
Member, American Physical Society and Materials Research Society

Research Interests:

Optical processes in reduced-dimensional semiconductors. Near-Field Scanning Optical Microscopy (NFSOM) is being developed to measure the emission and absorption spectra of single quantum dots and nanostructures. Design and fabrication of narrow quantum wires in GaAs for use as self-locking far-infrared detectors

Selected Bibliography:

1. B.B. Goldberg, D. Heiman, A. Pinczuk, L. Pfeiffer and K. West, (1991) "Localization and Many-body Interactions in the Quantum Hall Effect Determined by Polarized Optical Emission," Phys. Rev., B15, **44**, 4006.
2. B.B. Goldberg, D. Heiman, A. Pinczuk, L. Pfeiffer and K. West, (1990) "Optical Investigations of the Interger and Fractional Quantum Hall Effects: Energy Plateaus, Intensity Minima, and Line Splitting in Band-gap Emission," Phys. Rev. Lett., **65**, 641.
3. B.B. Goldberg, J.E. Furneaux, J. Oswald, G. Bauer and P.J. Stiles, (1990) "Anamalous Magneto-transport and Optical Transmission of PbTe Thin Films," Semicond. Sci. and Technol. **5**, S151.
4. B.B. Goldberg, D. Heiman, A. Pinczuk, (1989) "Exchange Enhancement of a Spin-polarized 2D Electron Gas Determined by Optical Absorption Spectroscopy," Phys. Rev. Lett. **63**, 1102.
5. G. J. Oswald, B B. Goldberg, G. Bauer and P.J. Stiles, (1989) "Magnetotransport Studies on the Metallic Side of the Metal-Insulator Transition in PbTe," Phys. Rev. B. **40**, 3032.

Name: KARL F. LUDWIG, JR. Assistant Professor, Department of Physics

Education: B A., Magna cum laude, Cornell University, Physics, 1980

M.S., Stanford University, Applied Physics, 1982
Ph.D., Stanford University, Applied Physics, 1986

Employment:
1988- Assistant Professor of Physics, Boston University
1986-88 Postdoctoral Research Associate, IBM Watson Research Center

Distinctions: Member, American Physical Society and Materials Research Society

Research Interests:

X-ray diffraction to study kinetic processes in materials and thin film structure. Time-resolved x-ray diffraction on the subsecond time scale is being used to understand the kinetics of crystallization and other phase transitions in metals and polymers and more recently, the kinetics of the bacteriorhodopsin photocycle.

Selected Bibliography:

1. K.F. Ludwig Jr., G.B. Stephenson, J. Jordan-Sweet, S. Brauer, J. Mainville, Y. Yang and M. Sutton, (1988) "Nucleated and Continuous Ordering in Cu_3Au," Phys. Rev. Lett., 61, 1859.
2. G.B. Stephenson, K.F. Ludwig Jr., J. Jordan-Sweet, S. Brauer, J. Mainville, Y.S. Yang and M. Sutton, (1989) "Instrumentation for Millisecond-Resolution Scattering Studies," Rev. Sci. Instrum. 60, 1537.
3. M. Sutton, Y.S. Yang, J. Mainville, J. Jordan-Sweet, K.F. Ludwig Jr. and G.B. Stephenson, (1989) "Observation of a Precursor During the Crystallization of Amorphous $NiZr_2$," Phys. Rev. Lett., 62, 288.
4. B. Park, G.B. Stephenson, S.M. Allen and K.F. Ludwig Jr., (1992) "The Development of Fluctuations into Domains during Ordering in Fe_3Al," Phys. Rev. Lett., 68, 1742.
5. T. Lei, K.F. Ludwig Jr. and T. Moustakas, "Heteroepitaxy, Polymorphism and Faulting in GaN Thin Films on Silicon and Sapphire Substrates," submitted to the Journal of Applied Physics.

Name: CLAUDIO REBBI, Professor, Department of Physics

Education:
Laurea in fisica, University of Torino, Italy, 1965
Ph.D. Specializzazione in fisica nucleare, University of Torino, Italy 1967

Employment:
1986 - Professor, Boston University
1984-85 Visiting Scientist, C.E.R.N. Geneva, Switzerland
1983-87 Senior Scientist, Brookhaven National Laboratory
1977-83 Scientist, Brookhaven National Laboratory
1970-73 Research Associate, C.E.R.N. Geneva, Switzerland
1968-69 Postdoctoral Fellow, California Institute of Technology

Administrative Positions at Boston University
1990 - Director, Center for Computational Science

Distinctions:
Vice-Chairman and Chairman of the Topical Group on Computational Physics of the American Physical Society, 1988-91
Fellow of the American Physical Society

Research Interests:

Advanced computational methods for theoretical particle physics; applications of simulation techniques to field theory and particle theory; calculation of non-perturbative properties of Quantum Chromodynamics; renormalization group methods for quantum field theories and spin systems; inclusion of fermionic degrees of freedom in computer simulations; multigrid methods; studies of solitons and other extended structures in quantum field theory; evolution and interaction of superconducting vortices and cosmic strings.

Selected Bibliography:

1. E. Meyers, C. Rebbi and R. Strilka, (1992) "A Study of the Interaction and Scattering of Vortices in the Abelian-Higgs (or Ginzburg-Landau) Model," Phys. Rev. D45, 1355.

2. R. Giles and C. Rebbi, (1992) "Computational Center Develops Practical Experience in Parallel Computing," Computers in Physics, 6, 122.
3. S. Huang, J. Potvin, C. Rebbi and S. Sanielevici, (1990) "Surface Tension in Finite-Temperature Quantum Chromodynamics," Phys. Rev. D42, 2864..
4. C. Rebbi, (1983) "Quantum Chromodynamics: The Guage Theory of Strong Interactions," Scientific American Magazine, 248, 54..
5. C. Rebbi, (1979) "Solitons in Particle Physics," Scientific American Magazine, 240, 92..

Name: KENNETH J. ROTHSCHILD, Professor, Department of Physics

Education: B.A., Rensselaer Institute of Technology, Physics, 1969
Ph.D., Massachusetts Institute of Technology, Physics, 1974

Employment:	1972-76	Research Asst. Harvard-MIT Program in Health Sci and Tech.
	1977-82	Assistant Professor of Physics Boston University
	1976-81	Asst. Professor of Physiology, B.U. School of Medicine
	1982-86	Associate Professor of Physics, Boston University
	1982-	Associate Professor of Physiology, B.U. School of Medicine
	1986 -	Professor of Physics, Boston University
	1984-88	Director, Ph.D. Program in Cellular Biophysics, B.U.

Distinctions: Fellow of the American Physical Society, 1991
Established Investigator of the American Heart Association, 1979-84
Netherlands Foundation for Basic Science Visiting Fellow Award, 1980
Fellow, National Institute of Health, 1977
Fellow, National Research Council, 1974-76
Fellow, Massachusetts Institute of Technology, 1971-74
Fellow, Sloan Foundation, 1969-79
General Motors Scholar, 1966-1969

Research Interests:
Energy transduction, ion transport and signal-transduction in biomolecules; biomolecular material development; Fourier transform infrared spectroscopy

Selected Bibliography: Over 100 papers

1. K. Douglas, N.A. Clark and K.J. Rothschild, (1990) "Biomolecular/solid-state Nanostructures," Appl. Phys. Lett., 56, 692-694.
2. K.J. Rothschild, M.S. Braiman, Y-W. He, T. Marti and H.G. Khorana, (1990) "Vibrational Spectroscopy of Bacteriorhodopsin Mutants: Evidence for the Interaction of Aspartic Acid 212 with Tyrosine 185 and Possible Role in the Proton Pump Mechanism," J. Biol. Chem., 265, 16985-16991.
3. O. Bousche, M.S. Braiman, Y-W. He, T. Marti, H.G. Khorana and K.J. Rothschild, (1991) "Vibrational Spectroscopy of Bacteriorhodopsin Mutants: Evidence That Asp-96 Deprotonates During the M=>N Transition of Bacteriorhodopsin,"J. Biol. Chem., 266, 11063-11067.
4. M. Swaerjo, K.J. Rothschild, B. Nappi, A. Lane and H. Gold, (1991) "Infrared Fiber Optic Sensors: New Applications in Biology and Medicine," Proc. SPIE, 1437, 60-65.
5. K.J. Rothschild, (1992) "FTIR Difference Spectroscopy of Bacteriorhodopsin: Towards a Molecular Model," J. Bioenerg. Biomemb., 24, 147-167.

Name: WILLIAM J. SKOCPOL, Professor and Associate Chair, Department of Physics

Education: B.A., Michigan State University, Physics, 1968
M.S., Harvard University, Physics, 1971

Ph.D., Harvard University, Physics, 1974

Employment:		
	1987 -	Professor of Physics, Boston University
	1989 -	Associate Chair, Department of Physics, Boston University
	1981-87	Member of Technical Staff, AT&T Bell Labs, Holmdel NJ
	1978-81	Associate Professor of Physics, Harvard University
	1974-78	Assistant Professor of Physics, Harvard University

Distinctions:
Fellow, American Physical Society, 1987
Distinguished Member of Technical Staff, AT&T Bell Labs, 1987
Rappaport Award (Best Paper IEEE Electron Devices Soc.), 1986
Member, American Physical Society, IEEE, and Materials Research Society

Research Interests:

High temperature superconducting thin films, ranging from basic dissipative properties to microwave circuit applications. wide-bandgap-gap semiconductors for optical and electronic devices.

Selected Bibliography:

1. K.S. Ralls, W.J. Skocpol, L.D. Jackel, R.E. Howard, L.A. Fetter, R.W. Epworth and D.M. Tennant, (1984) "Discrete Resistance Switching in Submicrometer Silicon Inversion Layers: Individual Interface Traps and Low-Frequency (1/f) Noise," Phys. Rev. Lett., 52, 288.

2. W.J Skocpol, P.M. Mankiewich, R.E. Howard, L.D Jackel, D.M. Tennant and A.D. Stone, (1986) "Universal Conductance Fluctuations in Silicon Inversion Layer Nanostructures," Phys. Rev. Lett. 56, 2865.

3. P.M. Mankiewich, J.H. Scofield, W.J. Skocpol, R.E. Howard, A.H. Dayem and E. Good, (1987) "A Reproducible Technique for Fabrication of Thin Films of High T_c Superconductors," Appl. Phys. Lett. , 51, 1753.

4. J.D. Hettinger, A.G. Swanson, W.J. Skocpol, J.S. Brooks, J.M Graybeal, P.M. Mankiewich, R.E. Howard, B. Straughn and E.G. Burkhardt, (1989) "Flux Creep and High-Field Critical Currents of Epitaxial Thin Films of $YBa_2Cu_3O_7$," Phys. Rev. Lett., 62, 2044

5. G. S.E. Romaine, P.M. Mankiewich and W.J. Skocpol, (1991) "High Temperature dc SQUID with Submicron $YBa_2Cu_3Cu_3O_7$Nanobridges," Appl. Phys Lett., 59, 2603.

Name: KEVIN E. SMITH, Assistant Professor, Department of Physics

Education:
B.A., Experimental Physics, Trinity College, Dublin, 1983
M.S., Applied Physics, Yale University, 1985
M. Phil., Applied Physics, Yale University, 1987
Ph.D. Applied Physics, Yale University, 1988

Employment:		
	1991-	Assistant Professor of Physics, Boston University
	1988-91	Research Associate, Department of Physics, University of Oregon

Distinctions:
Henry Prentiss Becton Prize, Yale University, 1989
Gold medal (Natural Sciences) Trinity College, Dublin, 1983
Hackett Prize, Trinity College, Dublin, 1983

Research Interests:

Physics and chemistry of solids and surfaces, particularly electronic and structural phenomena in the bulk and at the surfaces of novel materials.

Selected Bibliography:

1. K.E. Smith and S.D. Kevan, (1991) "The Electronic Structure of Solids Studied Using Angle Resolved Photoemission Spectroscopy," Progress in Solid State Chemistry, 21, 49

2. K.E. Smith and S.D. Kevan, (1990) "Non-Adiabatic Adsorbate Vibrational Damping and Surface Electronic Structure: H on W(001)," Phys. Rev. Lett., 64, 567.

3. K.E. Smith, G.S. Elliott and S.D. Kevan, (1990) "Reconstruction and Surface Fermi Surface of W(001)," Phys. Rev. B42, 5385.

4. W. Die, K.E. Smith and S.D. Kevan, (1991) "Surface Fermi Contours and Phonon Anomalies on Pt(111)," Phys. Rev. B 43, 12062.

5. K.E. Smith and V.E. Henrich, (1988) "Molecular Orbital Effects on Resonant Photoemission from Ti_2O_3 and V203," Solid State Commun. 68, 29.

Name: THOMAS T. TIBBITTS, Research Assistant Professor, Dept. of Physics

Education:
B.S. Biochemistry and Biophysics, Oregon State University, 1983
Ph.D., Biophysics, Brandeis University, 1990

Employment:

Employment:	1990	Research Assistant Professor, Physics, Boston University
	1992	Imaging Systems Consultant, Children's Hospital Neurology Research
	1990	Research Associate, Boston University, Dept. of Physics
	1990	Lecturer on Biophysics, Boston University Dept. of Physics

Distinctions:
NIH NRSA Fellow, 1992,
NIH Graduate Training Fellow 1983-87
Lissauer Research Fellow, 1985
Teagle Foundation Research Fellow, 1982

Research Interests:
Scanning tunneling microscopy (STM) to image the surface structure of native and genetically engineered bacteriorhodopsin photoreceptors in purple membrane, STM of biological (soft) thin films (peptides, viral coat proteins and phospholipids) using Langmuir-Blodgett deposition, X-ray Structure of Self-Assembling 2D membrane Protein Crystals

Selected Bibliography:

1. Tibbitts, T.T. and D.L.D. Caspar, "Deconvolving Disoriented Fiber Diffraction Data by Iterative Convolution and Local Regression," Acta Cryst., in press.

2. Tibbitts, T.T. D.L.D. Caspar, W.C. Phillips and D.A. Goodenough, (1990) "Diffraction Diagnosis of Protein Folding in Gap Junction Connexons," Biophys. J., 57, 1025-1036.

3. Caspar, D.L.D., G.E. Sosinsky, Tibbitts, T.T., W.C. Phillips and D.A. Goodenough, (1988) "Gap Junction Structure," in Gap Junctions, eds. E.L. Hertzberg and R.G. Johnson, Alan R. Liss, Inc. New York, pp. 117-133.

4. Tibbitts, T.T. and I. Isenberg, (1984) "Analysis of Ligand-Binding Data by Lambda Invariance Testing. Anal. Biochem., 138:472-480.

Department of Astronomy, Center for Space Physics

Name: SUPRIYA CHAKRABARTI, Associate Professor, Department of Astronomy

Education:
B.E., University of Calcutta, India, 1975
M.S. University of California, Berkeley, 1980
Ph.D. University of California, Berkeley, 1982

Employment:	1992 -	Associate Professor, Astronomy Department, Boston University
	1983-92	Senior Fellow, Space Sciences Laboratory, U.C. Berkeley
	1987-92	Associate Research Physicist, Space Sciences Laboratory, U.C. Berkeley
	1982-87	Assistant Research Physicist, Space Sciences Laboratory, U.C. Berkeley
	1980-82	Assistant Specialist, Space Sciences Laboratory, U.C. Berkeley

Distinctions:
Member, Inner Magentospheric Imater (IBM) Science Definition Team, NASA (1990)-)
Session Chairman, X-Ray/EUV Solid State Detectors II, SPIE Conference, San Diego (1990)
Member, Extreme Ultraviolet Explorer (EUVE) Science Team (1983-92)
Session Chairman, Data Acquisition and Analysis Systems, IEEE Nucl. Sci. Symposium (1989)
Member, Spectroscopy Subcommittee, Ground Based Optical Aeronomy (GBOA), NSF (1985-88)
Member, Stragetic Defense Initiative Organization (SDIO) European Technology Assessment Team (1986)
Member, Executive Committee, Space Sciences Laboratory, U.C. Berkeley (1985-86)
Authored and/or co-authored about 80 research articles (approximately 30 on photonics instrumentation), two chapters in Encyclopedia of Earth System Science, W.A. Nierenberg, (ed.), Academic Press, San Diego, (1991), edited and/or co-edited three international conferences (1992-93)

Selected Bibliography:

1. S. Chakrabarti, "Reliability Analysis of an Extreme Ultraviolet Spectrometer for Space Research," Space Sciences Instrumentation, 5, 137, (1980).
2. O.H.W. Siegmund, M. Lampton, J. Bixler, S. Chakrabarti, J. Vallerga, S. Bowyer and R.F. Malina, "Wedge and Strip Readout Systems for Photon Counting Detectors in Space Astronomy," Journal of Optical Society of America A, 3, 2139, (1986).
3. B. Welsh and S. Chakrabarti, "The Prospect of Space-based Interferometry at EUV and Soft X-Ray Wavelengths," SPIE Proceedings, **1546**, 108, (1991).
4. D.M. Cotton and S. Chakrabarti, "BEARS: The Berkeley EUV Airglow Rocket Spectrometer," Appl. Optics, in press, (1992).
5. J.S. Vickers, S. Chakrabarti, D.M. Cotton, T.A. Cook, R. Conant and J. Penegor, "Gas Ionization Solar Spectral Monitor (GISSMO)," Proc. SPIE, **1745**, (1992).

Aerospace and Mechanical Engineering

Name: THOMAS GARY BIFANO, Assistant Professor, Aerospace and Mechanical Engineering

Education:
Ph.D., Mechanical Engineering, N.C. State University, 1988
M.S., Mechanical Engineering & Materials Science, Duke University, 1983
B.S., Mechanical Engineering & Materials Science, Duke University, 1980

Employment: 1989 - Assistant Professor, Boston University

Distinctions:
Chairman, technical session, SPIE
Keynote address, regional meeting of OSA

Research Interests:
Ultraprecision machining of brittle materials, micro-mechanical actuators for adaptive optics

Selected Publications:

1. Bifano, T.G.; and Hosler, J. "Ultra-Precision Grinding of Thin Quartz Wafers," to appear in *Trans. ASME J. Engineering for Industry* (1992).
2. Bifano, T.G.; and Yi, Y. "Acoustic Emission as an In-Process Measurement of Grinding Ductility," *Precision Engineering* (October, 1992).
3. Bifano, T.G.; and Fawcett, S. "Specific Grinding Energy as an In-Process Control Variable for Ductile-Regime Grinding," *Precision Engineering* [13]4, pp. 256-62 (1991).
4. Bifano, T.G.; Dow, T.A.; and Scattergood, R.O. "Ductile-Regime Grinding: A New Technology for Machining Brittle Materials," *Trans ASME J Engineering for Industry* [113] 2, pp. 184-89 (1991).

5. Bifano, T.G.; Blake, P.; Dow, T.A.; and Scattergood, R.O. "Precision Machining of Ceramic Materials," *American Ceramic Society Bulletin*, [67] 6 pp. 1038-44 (1988).

Name: ALI NADIM, Associate Professor, Aerospace and Mechanial Engineering

Education: Ph.D., Chemical Engineering, MIT, 1986
M.S., Chemical Engineering, MIT, 1985
B.S., Chemical Engineering, UC Davis, 1982

Employment: 1991 - Associate Professor, Aerospace and Mechanial Engineering, Boston University
1986 - 91 Assistant Professor, Department of Mathematics, MIT

Research Interests:
Fluid dynamics, heat and mass transport, colloidal and interfacial phenomena, dynamics of bubbles and drops, applied mathematics.

Distinctions: Winner of the 1989-90 Science Council Prize of Excellence in Teaching Undergraduates at MIT.

Selected Publications:

1. Nadim, A.; and Stone, H. "The Motion of Small Particles and Droplets in Quadratic Flows," *Stud. Appl. Math.*, 85, 53-73 (1990).

2. Nadim, A.; Haj-Hariri, H.; and Borhan, A., "Thermocapillary Migration of Slightly Deformed Droplets," *Particulate Science and Tech*, 8, 191-198 (1990).

3. Nadim, A.; Stone, H.; and Strogatz, S., "Chaotic Streamlines inside Droplets Immersed in Steady Linear Stokes Flows," *J. Fluid Mech.*, 232, 629-646 (1991).

4. Nadim, A.; Borhan, A.; and Haj-Hariri, H., "Effect of Surfactants on the Thermocapillary Migration of a Concentric Compound Drop," *J. Colloid Interface Sci.*, 149, 553-560 (1992).

5. Nadim, A.; and Greenspan, H.P., "On Sonoluminescence of an Oscillating Gas Bubble," *Phys. Fluids*, (Submitted 1992).

Name: RAYMOND J. NAGEM, Assistant Professor, Aerospace and Mechanical Engineering

Education: Ph.D., MIT, 1988
M.S., MIT, 1982
B.S., MIT, 1980

Employment: 1988 - Assistant Professor, Boston University

Distinctions: Reviewer for Journal of Sound and Vibration, and Journal of Applied Mechanics
Principal Investigator for research sponsored by NSF and NASA

Research Interests:
Electromagnetic and elastic wave propagation, inverse scattering and asymptotic expansions, chiral media, quantum theory of coherent states of photons.

Selected Publications:

1. Moses, H.E.; Nagem, R.J.; and Sandri G.H. "The General Solution of the Three-Dimensional Acoustic Equation and of Maxwell's Equations in the Infinite Domain in Terms of the Asymptotic Solution in the Wave Zone," *Journal of Mathematical Physics*, Vol. 33, No. 1, pp. 86-101 (1992).

2. Hinders, M.K.;Trott, K.D.; Moses, H.E.; Nagem, R.J.; and Sandri, G.H. "Transmission through a Moving Chiral Slab," *Journal of the Optical Society of America B*, Vol. 8, No. 9, pp. 1958-61 (1991).

Name: DONALD WROBLEWSKI, Assistant Professor, Aerospace and Mechanical Engineering

Education: Ph.D., Mechanical Engineering, UC Berkeley, 1990

M.S., Mechanical Engineering, UC Berkeley, 1979
B.S., Mechanical Engineering, Penn State, 1978

Employment:
1991 - Assistant Professor, Aerospace and Mechanical Engineering, B.U.
1991 - Adjunct Research Professor, Mechanical Engineering, Naval Postgraduate School, Monterey, CA
1990 - 91 Visiting Assistant Research Engineer, Mechanical Engineering, UC Berkeley
1987 - 90 Research Assistant, Mechanical Engineering, UC Berkeley

Distinctions:
NSF Research Initiation Award, 1992
Whitaker Foundation Fellow, 1992

Research Interests:

Experimental investigations of heat transfer and flow phenomena in complex turbulent flows; development of advanced optical techniques for visualizing and measuring unsteady and three-dimensional turbulent flows.

Selected Publications:

1. Wroblewski, D.; and Eibeck, P. "Turbulent Heat Transport in a Boundary Layer Behind a Junction of a Streamlined Cylinder and a Wall," *Journal of Heat Transfer*, in press (1992).
2. Wroblewski, D.; and Joshi, Y. "Transient Natural Convection From a Leadless Chip Carrier in a Liquid Filled Enclosure: A Numerical Study," *J. Electronic Packaging* (September, 1992).
3. Wroblewski, D.; and Eibeck, P. "Measurements of Turbulent Heat Transport in a Boundary Layer with an Embedded Streamwise Vortex," *Int. Journal of Heat and Mass Transfer*, 34, pp. 1617-31 (1991).
4. Wroblewski, D.; and Eibeck, P. "A Frequency-Response Compensation Technique for Cold Wires and its Applications to a Heat-Flux Probe," *Experimental Thermal Fluids Sciences*, 4, pp. 452-63 (1991).

Biomedical Engineering

Name: CHARLES R. CANTOR, Professor of Biomedical Engineering; Professor of Biochemistry; Director, Center for Advanced Research in Biotechnology

Education:
A.B., Columbia University, *Summa Cum Laude*, 1963
Ph.D., University of California, Berkeley, 1966

Biography:

Professor of Biomedical Engineering and Biochemistry, Director of the Center for Biotechnology, Boston University (1992-present); Professor of Molecular Biology, Univ. California, Berkeley (1989-1992); Principal Scientist, Human Genome Project, U.S. Dept. of Energy (1990-1992); Senior Biochemist, Cell Molecular Biology Div., Lawrence Berkeley Lab. (1988-1991); Director, Human Genome Center, Lawrence Berkeley Laboratory (1988-1990); Higgins Professor of Genetics & Development, Columbia Univ. (1988-1989); Deputy Dir. for Biotechnology (1985-1988); 1985); Chairman of Genetics & Development, College of Physicians & Surgeons, Columbia Univ. (1981-1989); Professor (1972-1989); Asst. Professor of Chemistry, Columbia Univ. (1966-1969)

Distinctions:
Alfred P. Sloane Foundation Fellow (1969-1971)
Fresenius Award in Chemistry 1972)
Guggenheim Fellow (1973-1974)
Fairchild Distinguished Visiting Scholar, Caltech (1975-1976)
Eli Lilly Award in Biological Chemistry (1978); Fellow of AAAS (1981)
Outstanding Investigator Grant, NCI (1985)
Member National Academy of Sciences (1988)
Member of American Academy of Arts & Sciences (1988)
Herbert A. Sober Award, American Soc. for Biochem & Molecular Biology (1990)
Honorary Member, Japanese Biochemical Society (1990).

Research Interests

Mapping and sequencing the human genome; new technology for manipulating proteins and DNA in complex systems; the use of biological molecules in nanotechnology; molecular genetics of sensory perception.

Special responsibilities:

Member: Nomenclature Commission of the Int'l Union of Biochemistry and Molecular Biology; US National Committee of Internation Union of Pure and Applied Biophysics (Chairman, 1991-1994); Visiting Committee for Brookhaven Nat'l Lab. Biology Dept.; Cell and Membrane Transport Commission, International Union of Pure and Applied Biophysics; Advisory Committee, Searle Scholars Program; Exec. Committee, Int'l Human Genome Organization (HUGO) (also Chair, HUGO Human Genome Mapping Committee (HGMC); Vice President, 1991-present, and President, HUGO Americas, 1992). Advisory Committees: MacArthur Foundation Program in Parasite Biology; Board of Scientific Counselors, Nat'l Center for Biotechnology Information, Nat'l Library of Medicine; UNESCO Scientific Coordinating Committee on the Human Genome Project; European Molecular Biology Laboratory. Co-organizer, Cold Spring Harbor Laboratory Meetings on Genome Mapping and Sequencing.

Patents: (1) Cantor, C. R. and Schwartz, D. C. Electrophoresis Using Alternating Transverse Electric Fields. Patent No. 4,473,452, issued September 25, 1984; (2) Cantor, C. R. and Schwartz, D. C. Gel Inserts Useful in Electrophoresis. Patent No. 4, 695,548, issued September 22, 1987; (3) Cantor, C. R., Axel, R. and Argarana, C. DNA Encoding Streptavidin, Streptavidin Produced Therefrom, Fused Polypeptides Which Include Amino Acid Sequences Present in Streptavidins and Uses Thereof. Patent No. 4,839,293, issued June 13, 1989; (4) Cantor, C. R. and Schwartz, D. C. Electrophoretic Methods Employing Gel Inserts. Patent No. 4,861,448, issued August 29, 1989; (5) Sano, T., Glazer, A. N. and Cantor, C. R. Metallothionein Derivatives with Biological Recognition Specificity. Patent Pending; (6) Sano, T. and Cantor, C. R. Recombinant Streptavidin-Protein Chimeras Useful for Conjugation of Molecules in the Immune System. Patent Pending.

Selected Bibliography: Total papers published: 269

1. Chuck, R.S., Cantor, C.R.C., Tse, D.B. 1990. CD4-TCR Complexes on Human Leukemic T Cells. Proc. Natl. Acad. Sci. USA. 87, 5021-5025.
2. Sano, T. and Cantor, C.R. 1991. A streptavidin-protein A chimera that allows one-step production of a variety of specific antibody conjugates. *Bio/Technology* 9: 1378-1381.
3. Ito, T., Smith, C. L. and Cantor, C. R. 1992. Sequence-specific DNA Purification by Triplex Affinity Capture. *Proc. Natl. Acad. Sci. USA.* 89: 495-498.
4. Sano, T., Glazer, A. N. and Cantor, C. R. 1992. A streptavidin-metallothionein chimera that allows specific labeling of biological materials with many different heavy metal ions. *Proc. Natl. Acad. Sci. USA* 89: 1534-1538.
5. Sano, T., Smith, C. L., and Cantor, C. R. 1992. Immuno-PCR: very sensitive antigen detection by means of specific antibody-DNA conjugates. *Science* 258: 120-129.

Name: DAVID D. MOUNTAIN, Associate Professor, Biomedical Engineering

Education:

Ph.D., Electrical Engineering, University of Wisconsin, 1978
M.S., Electrical Engineering, Univeristy of Wisconsin, 1973
B.S., Electrical Engineering, MIT, 1968

Experience:

1984 -	Associate Professor, Biomedical Engineering, Boston University
1985 - 86	Visiting Reader, School of Biological Sciences, University of Sussex
1979 - 84	Assistant Professor, Biomedical Engineering and Otolaryngology, B.U.
1978 - 79	Postdoctoral Trainee, Dept. of Neurophysiology, U. of Wisconsin, Madison

Research Interests:

Fiberoptic motion sensors for biomedical applications.

Selected Publications:

1. Olson, E.S.; Mountain, D.C. "In Vivo Measurement of Basilar Membrane Stiffness," *Mechanics and Biophysics of Hearing*, P.Dallos, D.D. Geisler, J.W. Mattews, M.Ruggero, and C.R. Steele eds., 296-303, NY (1990).
2. Xue, S.; Mountain, D.C.; Hubbard, A.E. "Acoustic Enhancement of Electrically Evoked Otoacoustic Emissions: Experiment and Model Results," *Preceedings of the 17th Northeast Bioengineering Conference*, 217-18 (1991).
3. Olson, E.S.; Mountain, D.C. "In Vivo Measurement of Basilar Membrane Stiffness," *J Acoust. Soc. Am.* 89(3), pp. 1262-75 (1991).

Name: CASSANDRA L. SMITH , Professor of Biomedical Engineering, Professor of Biochemistry, Deputy Director, Center for Advanced Biotechnology

Education:
B.A., West Virginia University, 1967
M.S., West Virginia University Medical School, 1970
Ph.D., Texas A&M University, 1974

Employment:	1992-	Professor of Biomedical Engineering and Biochemistry and Deputy Director, Center for Advanced Biotechnology, Boston University College of Engineering
	1990-92	Senior Scientist, Division of Structural Biology, Lawrence Berkeley Laboratory, Department of Energy, Berkeley
	1988-92	Associate Professor in Residence, Departments of Molecular and Cell Biology, University of California, Berkeley
	1987-89	Assistant Professor, Departments of Microbiology and Psychiatry, College of Physicians & Surgeons, Columbia
	1981-87	Associate Research Scientist, Department of Genetics and Development, College of Physicians & Surgeons, Columbia
	1978-81	Research Associate, Chemistry Department, Columbia University, NIH Young Investigator Grant
	1975-78	National Institutes of Health Postdoctoral Fellowship
	1974-78	Fellow, Department of Genetics, The Public Health Research Institute of the City of New York, Inc.

Responsibilities:

Genome Database, Johns Hopkins University (1992-present); Co-chair of Human Chromosome 20 Committee, HUGO (1991-present); Scientific Advisory Board, Institute of New Technologies, St. Petersburg, Russia (1990-1991); Chairman, Editorial Board, Human Genome Abstracts, Cambridge Scientific Abstracts, Mass. (1989-present); Executive Editor, Gene Analysis: Techniques and Applications (1989-present); Managing Editor, International Journal of the Human Genome (1989-present); Editorial Board, Genomics (1987-present).

Research Interests:

Mapping and sequencing of DNA; structure, organization and function of whole chromosomes; molecular genetics of sensory perception.

Selected Bibliography: Total papers published: 120

1. Condemine, G. and Smith, C. L. 1990. Transcription regulates oxolinic acid induced DNA gyrase cleavage at specific sites on the *E. coli* chromosome. *Nuc. Acids Res.* **18**: 7389-7396.
2. Ito, T., Smith, C. L. and Cantor, C. R. 1992. Triplex affinity capture of a single copy clone from a yeast genomic library. *Nuc Acids Res* 20: 3624.
3. Zhang, T.Y., Smith, C. L. and Cantor, C. R 1991. Secondary pulsed field gel electrophoresis. *Nuc. Acids Res.* **19**: 1291-1296.
4. Ringquist, S. and Smith, C. L. 1992. Characterization and physical mapping of *in vivo* dam and dcm methylase resistant sites on the *Escherichia coli* chromosome. *Proc Natl Acad Sci USA* **89**: 4538-4543.

Electrical, Computer and Systems Engineering

Name: HASSAN M. AHMED, Research Associate Professor
Electrical, Computer, and Systems Engineering

Education:
Ph.D., Electrical Engineering, Stanford University, 1982
M.S., Aerospace Engineering, Carleton University, 1978
B.S., Electrical Engineering, Carleton University, 1977

Experience:		
	1992 -	Associate Professor, Boston University
	1987 -92	Research Associate Professor, Boston University
	1985 -87	Analog Devices, Inc.

Research Interests:
Digital communications, signal processing, VLSI, high speed communications over optical LANs.

Selected Publications:

1. Rauf, F.; and Ahmed, H.M. "Calculation of Lyapunov Exponents Through Nonlinear Adaptive Filtering," PROC. IEEE *International Symposium on Circuits and Systems*, 568-71 (June 1991).

2. Ahmed, H.M. "Directions in DSP Processors," *IEEE J. on Selected Areas in Communications.*, Invited. 8(8): 1420-27 (October 1990).

3. Ahmed, H.M.; and Rauf, F. "Nonlinear Adaptive Filtering, "*Handbook of Signal Processing.*," ed. C.H. Chen. 2nd edition. New York; Marcel Dekker (1992).

Name: YANEER BAR-YAM, Associate Professor, Electrical, Computer, and Systems Engineering

Education:
Ph.D., Physics, MIT, 1984
B.S., Physics, MIT, 1978

Employment:		
	1990 -	Associate Professor, Boston University
	1984 - 89	IBM T.J. Watson Research Center
	1988 - 91	Senior Scientist, Weizmann Institute of Science

Distinctions:
Member Phi Beta Kapa Honor Society (1978)
NSF Fellowship (1979-83)
Bantrell Post-Doctoral Fellowship (1984-1986)
Revson Fellowship (1988-90)

Research Interests:
Complex system dynamics, defects, and surfaces of electronic materials, material growth, high T_c superconductivity, ab initio theorectical studies of light-matter interactions and growth of photonic (semiconductor) thin film materials

Selected Publications:

1. Bar-Yam, Y; Pantelides, S.T.; Joannopoulos, J.D.; Allan, D.C.; and Teter, M.P. "The Oxygen Vacancy and the E1' Center in SiO_2." *SiO_2 and its Interfaces.* , edited by S.T. Pantelides and G. Lucovsky, Materials Research Society Conference Proceedings, Vol. 105, 223 (1988).

2. Allan, D.C.; Teter, M.P.; Joannopoulos, J.D.; Bar-Yam, Y.; and Pantelides, S.T. "Defect Studies in Silicon Dioxide by Local Density Approximation Total Energy Methods." *Atomic Scale Calculations in Materials Science*, edited by J. Tersoff, D. VAnderbilt, V. Vitek Materials Research Society Conference Proceedings, Vol. 141 (1989)

3. Bar-Yam, Y.; Lei, T.; Moustakas, T.D.; Allan, D.C.; and Teter, M.P. "Quasi-Equilibrium Nucleation and Growth of Diamond and Cubic Boron-Nitride," *Wide Band Gap Semiconductors*, (T.D. Moustakas, J.I. Pankove, and Y. Hamakawa) MRS Symp. Proc., Vol 242, p. 335 (1992)

Name: RICHARD C. BROWER, Professor , Electrical, Computer, and Systems Engineering

Education:
Ph.D., Physics, UC Berkeley, 1969
M.A., Applied Math, Harvard University, 1964
B.A., Physics, Harvard University, 1963

Employment:

1987 -	Professor, Electrical, Computer, and Systems Engineering, Boston University
1982 - 83	Visiting Professor of Physics, Harvard University
1973 - 86	Professor of Physics, UC Santa Cruz
1974 - 75	Sloan Foundation Fellow, SLAC
1972 - 73	Postdoctoral Associate, Caltech
1970 - 71	NSF Fellow at CERN
1969 - 72	Postdoctoral Associate, MIT

Distinctions:
NSF Postdoctoral Fellowship
A.P. Sloan Fellowship

Research Interests:
Statistical mechanics and quantum field theory of materials; acceleration algorithms for parallel supercomputers.

Selected Publications

1. Brower, R.C.; and DeLisi, C. "Impact of Massively Parallel Computation on Protein Structure Determination," *High Performance Computing in Biomedical Research*, ed. T.C. Pilkington, B. Loftis, T. Palmer, and T.F. Budinger. Boca Raton, FL: CRC Press, in press (1992).

2. Brower, R.C.; and Huang, S. "Random Surface Dynamics for Z_2 Gauge Theory," *Physics Review D*, 41:708 (1990).

3. Brower, R.C.; Tamayo, P.; and York, B. "Parallel Multigrid Algorithm for Percolation Clusters," *Journal of Stat Phys*. 63:73 (1991).

Name: DAVID A. CASTAÑON, Associate Professor , Electrical, Computer, and Systems Engineering

Education:
Ph.D., Applied Mathematics, MIT, 1976
B.S., Electrical Engineering, Tulane University, 1971

Employment:

1990 -	Associate Professor, Electrical, Computer, and Systems Engineering, B.U.
1982 - 90	Senior Research Scientist, Alphatech, Inc.
1976 - 81	Research Associate, Laboratory for Information and Decision Systems, MIT

Distinctions:
Member of AMS, SIAM, IEEE, ORSA, Tau Beta Pi, Phi Eta Sigma
Associate Editor, IEEE Transactions on Automatic Control, 1984 - 1988
AFCEA Best Paper Award, JDL Conference on Command and Control Research, 1988
Refereed 34 journal and 68 conference papers.

Research Interests:
Stochastic control, optimization, estimation and parallel computation; applications of robust and stochastic control techniques to adaptive control of deformable optics.

Selected Publications:

1. Lehtomaki, N.; Castañon, D.A.; Levy, B.C.; Stein, G.; Sandell, N.R.; and Athans, M. "Robustness and Modeling Error Characterization," *IEEE Trans. Automatic Control* (March 1984).

2. Birdwell, D.; Athans, M.; and Castañon, D.A "On Reliable Control System Design," *IEEE Trans. Systems, Man & Cybernetics* (September 1986).

3. Bertsekas, D.P.; and Castañon, D.A. "Adaptive Aggregation Methods for Dynamic Programming," *IEEE Trans. on Automatic Control* (June 1989).

4. Castañon, D.A. "Efficient Algorithms for Finding the Best K paths Through a Trellis," *IEEE Trans. on Aerospace and Electronic Systems* (March 1990).

Name: SCOTT T. DUNHAM, Assistant Professor , Electrical, Computer, and Systems Engineering

Education:	Ph.D., Electrical Engineering, Stanford University, 1985 M.S., Electrical Engineering, Stanford University, 1980 B.S., Electrical Engineering, Cornell University, 1979	
Employment:	1985 -	Assistant Professor, Electrical, Computer, and Systems EngineeringB.U.
	1980 - 85	Research Assistant, Stanford University
	1979 - 80	Technical Staff, Bell Telephone Laboratories

Research Interests:

Growth of thin dielectrics; point defect interactions in heavily-doped silicon; doping with Er ++ for optical amplifiers.

Selected Publications:

1. Dunham, S.T. "Analysis of the Effect of Thermal Nitridation of Silicon Dioxide on Silicon Interstitial Concentration," *J. Appl. Phys.*, [62], 1195 (1987).

2. Dunham, S.T. "Interstitial Kinetics near Oxidizing Silicon Interfaces," *J. Electrochem. Soc.*, [136], 250 (1989).

3. Dunham, S.T.; and Meade, R.A. "Point Defect Models for High Concentration Phosphorus Diffusion," *Second International Symposium on Process Physics and Modeling in Semiconductor Technology*, G. Srinivasan, J. Plummer and S. Pantelides, eds. (Electrochem. Soc. Proc. PV91-4, Pennington, NJ, pp. 287-303 (1991).

4. Dunham, S.T.; and Jeng, N. "Enhanced and Retarded Dopant Diffusion During Oxidation in Dry O_2," *Appl Phys. Lett.* 59(16), 2016 (1991).

5. Dunham, S.T. "Interactions of Point Defects with SiO_2 Films," *J. Appl. Phys.* 71(1) (1992).

Name: JOSHUA ETKIN, Assistant Professor, Electrical, Computer, and Systems Engineering

Education:	Ph.D., Computer Engineering, Ben-Gurion University, Beer-sheva, Israel, 1985 M.S., Computer Engineering, Tel-Aviv University, Tel-Aviv, Israel, 1977 B.S., Electrical Engineering, Technion-Isreal Institute of Technology, 1971	
Experience:	1985 -	Assistant Professor, Electrical, Computer, and Systems Engineering B.U.
	1983 - 85	Visiting Instructor, ECS Department, Boston University
	1971 - 83	Department Manager, Telrad Inc., Israel, R&D Division
	1964 - 68	Israeli Air Force, Radar System Technician

Research Interests:

LANs, ISDN and Broadband ISDN, distributed architecture and operating systems for real time applications, network management and sercurity, distributed debugging and analysis tools for networks and ISDN.

Selected Publications:

1. Etkin, J.; and Zinky, J.A. "Development Life Cycle of Computer Networks; The Executable Model Approach," *IEEE Trans on Software Eng.*, 15:1078-89 (September 1989).

2. Etkin, J. "Real-time Local Network in the Manufacturing Plant: Intelligence, Not Just a Link," *International Journ. on Robotics and Computer Integrated Manufacturing,"* 6 (3): 191-98 (1989).

3. Zinky, J.A.; and Etkin, J. "Troubleshooting Throughput Bottlenecks Using Executable Models," *Computer Networks and ISDN Systems Journal* 24:33043 (March 1992).

Name: KAIGHAM J. GABRIEL, Associate Professor, Electrical, Computer, Systems/Biomedical Engineering Departments

Education:
Sc.D., Electrical Engineering, MIT, 1983
M.S., Electrical Engineering, MIT, 1979
B.S., Electrical Engineering, University of Pittsburgh, 1977

Employment:

1991 -	Associate Professor, Electrical, Computer, Systems/Biomedical Engineering Departments, Boston University Research Associate, MIT
1985 - 91	Principal Investigator, AT&T Bell Laboratories
1989 - 90	Visiting Associate Professor, University of Tokyo
1984 - 85	Lecturer, Electrical Engineering and Computer Science Department, MIT

Distinctions:
Institute Young Professor Research Award, University of Tokyo, 1990
Individual Performance Award, AT&T Bell Laboratories, 1989

Research Interests:
Micro-mechanical actuators for adaptive optics; micro-mechanics

Selected Publications:

1. J. Walker, K.J. Gabriel, and M. Mehreganyu, "Mechanical Integrity of Polysilicon Films Exposed to Hydrofluoric Acid Solutions," *IEEE Jrnl. of Electronic Materials*, in press, 1992.

2. H. Fujita, and K.J. Gabriel, "New Opportunities for Micro-Actuators," *Sensors and Actuators*, in press, 1992.

3. N. Takeshima, K.J. Gabriel, M. Ozaki, H. Fujita, H. Horiguchi, Y. Takahashi, "An Electrostatic Parallelogram Actuator," *Technical Digest of 6th IEEE Transducers '91 Conference*, p 63-66, San Francisco, CA, June 1991.

4. K.J. Gabriel, "Prospects for IC-based Micro Electromechanical Devices", invited paper, *Journal of the Robotics Society of Japan*, Vol. 8, No. 4, pp. 63-68, 1991.

5. R.T. Howe, R.S. Muller, K.J. Gabriel, W.S. Trimmer, "Silicon Micromechanics: Sensors and Actuators on a Chip," *IEEE Spectrum*, July 1990, pp. 29-35.

Name: ROSCOE GILES, Associate Professor, Electrical, Computer, and Systems Engineering

Education:
Ph.D., Physics, Stanford University, 1975
M.S., Physics, Stanford University, 1973
B.A., Physics, University of Chicago, 1970

Employment:

1992 -	Deputy Director, Center for Computational Science
1985 -	Associate Professor, Electrical, Computer, and Systems Engineering, Boston University
1985 -90	Research Associate, Center for Theoretical Physics, MIT
1979 - 85	Assistant Professor, Department of Physics, MIT
1976 - 78	Post-Doctoral Fellow, Center for Theoretical Physics Group, SLAC

Distinctions:
University Scholar - Teacher of the Year 1992-93
AT&T Foundation Faculty Fellow, Boston University
Fannie and John Hertz Foundation Fellow, 1970-1974

Research Interests:

Computational science, advanced computer architectures, distributed and parallel computing, magnetic materials, computational physics.

Selected Publications:

1. Giles, R.; and Rebbi, C. "Computational Center Develops Practical Experience in Parallel Computing," *Computers in Physics*, 6, 121 (1992).
2. Giles, R.; Alexopoulos, P.; and Mansuripur, M. "Micromagnetics of Thin Cobalt-based Media for Magnetic Recording," *Computers in Physics*, 6, 53 (1992).
3. Giles, R.; and Mansuripur, M. "Micromagnetics of Thin-Film CoX Media for Longitudinal Magnetic Recording," *J. Appl. Physics*, 69, p. 4712 (1991)
4. Giles, R.; and Tamayo, P. "A Parallel Scalable Approach to Molecular Dynamics on the CM-5," *Proceedings of Conference on Scalable High Performance Computing*, (April 1992).

Name: MARK N. HORENSTEIN, Associate Professor, Electrical, Computer, and Systems Engineering

Education:
Ph.D., MIT, 1978
M.S., UC Berkeley, 1975
B.S., MIT, 1973

Employment:

1990 -	Associate Chair for Undergradute Programs, Electrical, Computer, and Systems Engineering, B.U.
1985 -	Associate Professor, Electrical, Computer, and Systems Engineering, B.U.
1979 - 85	Assistant Professor, Electrical, Computer, and Systems Engineering, B.U.
1978 - 79	Research Engineer, Spire Corporation

Distinctions:
Teacher of the Year Award, Boston University College of Engineering, 1980
AT&T Foundation - American Society for Engineering Education: Award for Excellence in Instruction of Engineering Students, 1984

Research Interests:
Optical materials and devices, applied electromagnetics, microelectronics and photonics.

Selected Publications:

1. Greenwald, A.; Horenstein, M.; Ruane, M.; Clouser, W.; Foresi, J. "Chemical Vapor Deposition of Stomtium-Barium Niobate," *Materials Research Society Proceedings*, [243], p. 457.
2. Horenstein, M. "Microelectronic Circuits and Devices," Englewood Cliffs, NJ; Prentice-Hall (1990).

Name: ALLYN HUBBARD, Associate Professor, Electrical, Computer, and Systems Engineering

Education:
Post-Doc., Biomedical Engineering, Johns Hopkins University, 1979
Ph.D., Electrical Engineering, University of Wisconsin, 1977
M.S., Electrical Engineering, University of Wisconsin, 1971
B.S., Electrical Engineering, University of Wisconsin, 1970

Experience:

1986 -	Associate Professor, Biomedical Engineering, Boston University
1984 -	Associate Professor, Electrical, Computer, and Systems Engineering, B.U.
1986 - 87	Senior Engineer, Raytheon (Sabbatical leave)
1979 - 84	Assistant Professor, ECS and Otolaryngology Special Scientific Staff Member, Boston City Hospital
1977 - 79	NIH Postdoctoral Fellow, Johns Hopkins University

Distinctions:
National Research Service Award
Director , Digital VLSI Design Laboratory

Research Interests:

Measurements in the auditory system using laser/imaging techniques, VLSI circuit design, biomedical applications of VLSI.

Selected Publications:

1. Hubbard, A.E.; Houghton, B.P. "A Planar Electrode Array in Standard CMOS Technology," *Proc. 8th Annual University/ Government/Industry Microelectronics Symposium*, 168-171 (1989).
2. Wightman, C.W.; and Hubbard, A.E "A Data-Parallel Integrated Signal Detection Architecture," *Proc. 8th Annual University/ Government/Industry Microelectronics Symposium*, 252-255 (1989).
3. Xue, S.; Mountain, D.; and Hubbard, A. "Effect of Simultaneous acoustic input on the Electrically Evoked Acoustic Emissions," *Abstracts of the 15th Midwinger Research Meeting of the ARO* [fiber-optic probe measurements; the bulk of the work has not yet been published.] (1992).
4. Hubbard, A.E. "A Traveling-Wave Amplifier Model of the Cochlea, " Science, accepted.

Name: FLOYD B. HUMPHREY, Research Professor, Electrical, Computer, and Systems Engineering

Education:
Ph.D., Chemistry and Physics, California Institute of Technology, 1956
B.S., Chemistry, California Institute of Technology, 1950

Experience:

1987 -	Research Professor, Boston University
1980 - 87	Principal Research Scientist, CMU Magnetics Technology Center, Carnegie Mellon University
1964 - 80	Professor, California Institute of Technology
1960 - 64	Jet Propulsion Laboratory
1955 - 60	Bell Laboratories

Distinctions:
IEEE Magnetics Society Medal, 1989
IEEE Outstanding Lecturer, 1973 - 1977
5 patents

Research Interests:
Magnetism, magnetic materials, computer memory, magnetic sensors.

Selected Publications: 110 journal papers

1. Bagneres, A.; Patterson, B.N.; and Humphrey, F.B. "Dynamics of Wall and Bloch Line Motion Using 3d Simulations," *IEEE Trans. Magn.* [27] (1991).
2. Humphrey, F.B. "Domain Walls and Wall Structures," *Science and Technology of Nanostructures Magnetic Materials*, Hadjipanayis, Prinz and Pareti, eds., Plenum Publishing Co., NY, pp. 269-74 (1991).
3. Patterson, G.; Giles, R.; and Humphrey, F.B. "Two Dimensional Non-Equilibrium Dynamics of Domain Wall Motion," *J. Appl. Phys.*, [69], 5757 (1991).
4. Shaefer, R.; Ho, W.K.; Yamasaki, J.; Hubert, A.; and Humphrey, F.B. "Antisotropy Pinning of Domain Walls in Soft Magnetic Material," submitted for publication.
5. Mohri, D.; Humphrey, F.B.; Kawashima, K.; Kimura, K. and Mizutani, M. "Large Barkhausen Effect and Matteucci Effect in FeCoSiB, FeCrSiB, an FeNiSiB Amorphous Wires," *IEEE Trans. Magnetics*, [26], 1789 (1990).

Name: ROBERT G. HOHLFELD, Assistant Professor , Electrical, Computer, and Systems Engineering

Education:
Ph.D., Astronomy, Cornell University, 1980
M.S., Astronomy, Cornell University, 1976
B.S., Physics, MIT, 1974

Employment:	1985 -	Assistant Professor, Electrical, Computer, and Systems Engineering, Boston University
	1984 - 85	Assistant Professor, Astronomy Department, Boston University
	1983 - 84	Assistant Professor, Physics Department, Northeastern University
	1980 - 82	Staff Scientist, Department of Earth and Planetary Sciences, MIT

Distinctions: Associate of the Harvard College Observatory, 1984 - 1990

Research Interests:

Plasma physics, space physics, imaging theory, phased array antennas, computer simulation and modeling techniques, plasma materials processing.

Selected Publications:

1. King, J.I.F.; Hohlfeld, R.G.; and Kilian, J.C. "Application and Evaluation of a Differential Inversion Technique for Remote Temperature Sensing," *Meteorology and Atmospheric Physics*, 41, pp. 115-26 (1989).

2. Hohlfeld, R.G.; King, J.I.F.; Drueding, .T.W.; and Sandri, G.V.H. "Solution of Convolution Integral Equations by the Method of Differential Inversion," *SIAM J. Appl Math.*, in press (1992).

3. Hohlfeld, R.G.; Spatagna, S.M.; and Sandri, G.V.H. "Directo Solution of the Wave Equation using Parallel Computional Techniques," *7th Annual Review of Progress in Applied Computational Electromagnetics*, 203-21 (1991).

Name: P. ROBERT KOTIUGA, Assistant Professor, Electrical, Computer, and Systems Engineering

Education:

Ph.D., Electrical Engineering, McGill University, 1985
M.S., Electrical Engineering, McGill University, 1982
B.E., Electrical Honors, McGill University, 1981

Experience:	1987 -	Assistant Professor, Electrical, Computer, and Systems Engineering, B.U.
	1985 - 87	Postdoctoral research, Department of Mathematics, MIT

Research Interests:

Mathematical and computational methods in electromagnetics.

Selected Publications:

1. Kotiuga, P.R. "Helicity Functional and Metric Invariance in Three Dimensions," *IEEE Trans. MAG -25* (4):2813-15 (1989).

2. Kotiuga, P.R.; and Giles, R. "A Topological Invariant for the Accessibility Problem of Micromagnetics," *J. of Applied Physics* 67(9): 5347-49 (1990).

3. Kotiuga, P.R. "Analysis of Finite-element Matrices Arising From Discretizations of Helicity Functionals," *J. of Applied Physics* 67(9):5815-17 (1990).

Name: THOMAS D.C. LITTLE, Assistant Professor, Electrical, Computer, and Systems Engineering

Education:

Ph.D., Computer Engineering, Syracuse University, 1991
M.S., Electrical Engineering, Syracuse University, 1989
B.S., Biomedical Engineering, Rensselaer Polytechnic Institute, 1983

Employment:	1991 -	Assistant Professor, Electrical, Computer, and Systems Engineering, B.U.
	1988 - 90	Instructor, Department of Computer Engineering, Syracuse University
	1986 -91	Research Assistant, NY State Center for Advanced Technology in Computer Applications and Software Engineering.
	1985 - 89	Design Engineer, Webb Research Corporation

Distinctions:

NSF Research Initiation Award, 1992
Interactive Media Exhibits, Chair, ACM Multimedia '93

Program committee member, 13th IEEE ICDCS, 1993
IEEE Multimedia Computing Task Force working group (WG-6) member

Research Interests:

Multimedia computing: communications protocols, bandwidth allocation, optical communications, real-time computing.

Selected Publications:

1. Little, T.D.C.; and Gibbon, J.F. "Management of Time-Dependent Multimedia Data," *Proc. SPIE Symposium* OE/FIBERS'92 (1992).
2. Little, T.D.C.; and Ghafoor, A. "Scheduling of Bandwidth-Constrained Multimedia Traffic," *Computer Communications* (Special Issue: Multimedia Communications), [15], 5, pp. 381-87 (July/August 1992).
3. Little, T.D.C..; Ghafoor, A. "Multimedia Synchronization Protocols for Broadband Integrated Services," *IEEE Journal on Selected Areas in Communications* (Special Issue: Architectures and Protocols for Integrated Broadband Switching), [9],9, pp. 1368-82 (December 1991).
4. Little, T.D.C.; Ghafoor, A. "Spatio-Temporal Composition of Distributed Multimedia Objects for Value-Added Networks," *Computer*, [24],10, pp. 42-50 (October 1991).
5. Little, T.D.C.; Ghafoor, A. "Distributed Multimedia Object Management and Compostion," *IEEE Network*, [4],6, pp. 32-49 (November 1990).

Name: ANTON MAVRETIC, Associate Professor, Electrical, Computer, and Systems Engineering

Education:
Ph.D., Electrical Engineering, Pennsylvania State University, 1968
M.S., Electrical Engineering, University of Denver, 1961
B.S., Electrical Engineering, University of Denver, 1959

Employment:	1980 -	Associate Professor, Electrical, Computer, and Systems Engineering B.U.
	1978 - 80	Senior Staff Member, Harvard College Observatory
	1968 - 78	Project Engineer, MIT
	1965 - 68	Instructor of Electrical Engineering, Penn State University
	1964 - 65	Research Engineer, Westinghouse Laboratories, Pittsburgh, PA

Distinctions:
Analog Devices Professorship Chair, 1984 - 199
NASA Achievement Award, Voyager I and II missions, 1981
NASA Achievement Award, Explorer missions, 1975

Research Interests:

Satellite and space instrumentation, special purpose computers, and electronics for sensor technology; analog I.C. design and high-speed digital design using GaAs.

Selected Publications:

1. Ramsden, E.; Ruane, M.; Mavretic, A.; D'Angelo, H.; and Caramanis, M. " The Use of Hardware Simulators in Modeling Production Networks," *Large Scale Systems J. of Theory and Applications*, 11(2):149-64 (1986).
2. D'Angelo, H.; Caramanis, M.; Finger, S.; Mavretic, A.; Phillips, Y.; and Ramsden, E. "Event-driven Model of Unreliable Production Lines With Storage," *Intern J. of Prod Res.*, 26(7):1172-82 (1987).
3. Mavretic, A "Analog Circuits," *VLSI Handbook*, Chapter 24 (29.03 to 29.30)
NY: McGraw-Hill, (1989).

Name: THEODORE D. MOUSTAKAS, Professor, Electrical , Computer, and Systems Engineering

Education:
Ph.D., Solid State Science, Columbia University, 1974
M.S., Physics, Aristotle University, Greece, 1967
B.S., Physics, Aristotle University, 1964

Experience: 1987 - Professor, Electrical, Computer, and Systems Engineering, B.U.
1977 - 87 Senior Research Scientist, Exxon Corporate Research Laboratories
1974 - 77 Research Fellow, Harvard University

Distinctions: IBM Doctoral Fellowship, Columbia University, 1971 - 1974
IBM Postdoctoral Fellowship, Harvard University, 1974
Technical Advisor to United Nations Industrial Development Organization, 1989

Research Interests:
Material science and semiconductor devices, including:
- molecular beam epitaxy of III-V compounds
- wide bandgap semiconductors (diamond and III-V nitrides)
- amorphous semiconductors

Selected Publications:

1. Moustakas, T.D.; Lei, T.; and Molnar, R.J. "Growth of GaN by ECR-assisted MBE," *Physica B*, Vol. 189, (1993)

2. Lei, T.; Moustakas, T.D.; Graham, R.J.; He, Y.; and Berkowitz, S.J. "Epitaxial Growth and Characterization of Zincblende GaN on (001) Si," *J. Appl. Phys.*, 71, 4933, (1992).

3. Molnar, R.J.; and Moustakas, T.D. "Electron Transport Mechanism in GaN," *Appl. Phys. Lett.* 62, 72, (1993).

4. Eddy, C.R., Moustakas, T.D., and Scanlon, J., "Growth of Gallium Nitride Thin Films by Electron Cyclotron Resonance Microwave Plasma-assisted Molecular Beam Epitaxy," *J. Appl;. Phys.*, 73, 448 (1993)

5. Bar-Yam, Y.,and Moustakas, T.D. " Defect-Induced Stabilization of Diamond Films, " *Nature*, [342], 786 (1989).

Name: DAVID A PERREAULT, Associate Professor, Electrical, Computer, and Systems Engineering

Education: Ph.D., Electrical Engineering, Purdue University, 1970
M.S., Electrical Engineering, Purdue University, 1968
B.S., Electrical Engineering, Purdue University, 1968

Employment: 1975 - Associate Professor, Electrical, Computer, and Systems Engineering, B.U.
1980 - President, P&E Microcomputer Systems, Inc.
1970 - 75 Assistant Professor, Clarkson College of Technology
1968 - 70 Graduate Instructor and Research Assistant, Purdue University

Distinctions: Member IEEE, ASEE, HKN, Sigma Xi, Tau Beta Pi

Research Interests:
Nonlinear networks, CAD, microprocessors, distributed signal networks.

Selected Publications:

1. Perreault, D. "Engineering Design Using Xilinix RAM Based Logic Devices," *Digital Equipment Corporation*, Littleton, MA (May 1988).

2. Perreault, D. "ISDN Applications and Development in a Tactical Environment," *Rome Air Development Center*, Rome, NY (July 1988).

Name: MICHAEL F. RUANE, Associate Professor , Electrical, Computer, and Systems Engineering

Education: Ph.D., Systems Engineering, MIT, 1980

M.S., Electrical Engineering, MIT, 1973
B.S., Electrical Engineering, Villanova University, 1969

Experience:

1989 -	Associate Professor, Electrical , Computer, and Systems Engineering
1988 -	Associate Chair for Graduate Studies, ECS Department, Boston University
1980 - 88	Assistant Professor, ECS Department, Boston University
1973 - 78	Sponsored Research Staff, Energy Laboratory, MIT
1969 - 71	Peace Corps Volunteer, Sierra Leone, West Africa

Distinctions:
NSF Traineeship, MIT, 1971
General Motors Scholar, Villanova University
2 patents

Research Interests:

Optical systems, fiber optics, magneto-optical materials and storage devices, fiber sensors, communication systems.

Selected Publications:

1. Calkins, J.; Ruane, M.; and Mansuripur, M. "Dynamic Measurement of Domain Wall Motion in Amorphous Rare Earth-Transition Metal Alloys," *IEEE Trans. Mag. and Mag.* 24(6):2314 (1988).
2. Ruane, M.; and Calkins, J. "Characterizaiton of Amorphous TbFeCo films for Magneto-optical Media," *J. Applied Physics* 63(8): 3630 (1988).
3. Zhou, Y.; and Ruane, M. "Considerations for Using the Attenuated Total Reflection Technique for Characterizing Magneto-optic Media," *J. Applied Physics* 63(9):01 (1990).
4. Greenwald, A.; Horenstein, M.; Ruane, M.; Clouser, W.; Foresi, J. "Chemical Vapor Deposition of Stomtium-Barium Niobate," *Materials Research Society Proceedings*, [243], p. 457.

Name: JOHANNES G. SMITS, Associate Professor Electrical, Computer, and Systems Engineering

Education:
Ph.D., Electrical Engineering, Twente University, Holland, 1978
M.S., Physics, University of Leyden, 1970
B.S., Physics, University of Leyden, 1966

Experience:

1985 -	Associate Professor, Electrical, Computer, and Systems Engineering, B.U.
1988 -	President of Scaldis Micromechanics Inc.
1980 - 85	Head Scientific Co-worker, Twente University Enschede, The Netherlands

Research Interests:

Integrated Sensors, integrated actuators, micro-mechanics, piezoelectric devices and materials.

Selected Publications:

1. Smits, J.G. "Analysis and Review of Piezoelectic Microactuators," Invited Review paper in the SIMS'88, Symposium on Innovation in Measurement Science, Geneva, NY (August 1988).
2. Smits, J.G. "Piezoelectric on Silicon Microactuators," Invited paper given at the Symposium on Technology for Microminiature Actuators and Sensing Systems, Electonic Design Center, Case Western Reserve University, Cleveland, OH (October 1988).
3. Smits, J.G. "Piezoelectric Micropump with Three Microvalves Working Peristaltically," *5th International Conference on Solid State Sensors and Actuators*, Switzerland (June 1989).
4. Smits, J.G. "Is Micromechanics Becoming A New Subject for Academic Courses, or the Design of a Piezoelectric on Silicon Microrobot," *8th Biennial University/Governemnt/Industry Microelectronics Symposuim*, Westborough, MA (June 1989).

Name: M. SELİM ÜNLÜ, Assistant Professor, Electrical, Computer, and Systems Engineering

Education:
Ph.D., Electrical Engineering, University of Illinois at Urbana-Champaign, 1992
M.S., Electrical Engineering, University of Illinois at Urbana-Champaign, 1988
B.S., Electrical Engineering, Middle East Technical University, Ankara, Turkey, 1986

Employment:

1992 -	Assistant Professor, Electrical, Computer, and Systems Engineering, B.U.
1986 - 92	Research Assistant, University of Illinois at Urbana-Champaign
1984 - 86	Researcher, Military Electronic Industries, Inc., Ankara, Turkey

Distinctions:
Listed in American Men and Women of Science, 1992
Honor Fellowship, Turkish Scientific and Technical Research Foundation, 1982-86
Member, IEEE

Research Interests:
Design, processing, and characterization of compound semiconductor devices, photodetectors, computer simulation of optoelectronic devices.

Selected Publications:

1. Unlu, M.S.; Strite, S.; Demirel, A.L.; Tasiran, S.; Salvador, A.; and Morkoc, H. "Wavelength Selective Optical Logic and Interconnects," *IEEE J. Quantum Electron*, In press (1993).

2. Kishino, K.; Unlu, M.S.; Chyi, J.I.; Salvador, A.; Arsenault, L.; Reed, J.; and Morkoc, H. "Resonant Cavity Enhanced (RCE) Photodetectors," *IEEE J. Quantum Electron*, [27] pp. 2025-34 (1991).

3. Unlu, M.S.; Strite, S.; Demirel, A.L.; Salvador, A.; and Morkoc, H. "Wavelength Discriminating Optical Switch," *IEEE Photon. Technol. Lett.* [3], pp. 1126-29 (1991).

4. Unlu, M.S.; Leblebici, Y.; Kang, S.M.; and Morkoc, H. "Transient Simulation of Resonent Cavity Enhanced Heterojunction Photodiodes," *IEEE Photon. Technol. Lett.* [4], in press (1992).

Name: RICHARD F. VIDALE, Professor, Electrical, Computer, and Systems Engineering

Education:
Ph.D., Engineering Mechanics, University of Wisconsin, 1964
B.S., Mechanical Engineering, University of Rochester, 1958

Employment:

1982 -	Professor, Electrical, Computer, and Systems Engineering, B.U.
1970 - 81	Professor and Chairman, Department of Electrical, Computer, and Systems Engineering, Boston University
1967 - 69	Associate Professor and Chairman, Systems Engineering Option, B.U.
1964 - 66	Assistant Professor of Systems Engineering, Boston University

Distinctions:
Panelist, NSF Undergraduate Curriculum & Course Development in Engineering, Mathematics and the Sciences.

Research Interests:
Software and systems engineering applied to real-time, distributed systems.

Selected Publications:

1. Clough, A.J.; Vidale, R.F.; and Yuhas, T.J. "A Development Methodology for Distributed Real-time Systems," *Proc. 8th Annual National Conference on Ada Technology* (March 1990).

2. Vidale, R.F.; and Fujita-Yuhas, T. "Verifying Concurrent System Behavior with Petri Net Invariants," *AIAA Computing in Aerospace Conference*, Baltimore, MD. (October 1991).

3. McLendon, W.W.; and Vidale, R.F. "Verifying Properties of Ada Designs Using Colored Petri Nets," *Proc., AIAA Comuting in Aerospace Conference* (October 1991).

4. McLendon, W.W., Jr.; and Vidale, R.F. "Analysis of an Ada System Using Coloured Petri Nets and Occurence Graphs," *Application and Theory of Petri Nets 1992, K. Jensen, ed.*, Lecture Notes in Computer Science No. 616, Berlin: Springer-Verlag, 1992.

Manufacturing Engineering

Name: SOUMENDRA N. BASU, Assistant Professor, Manufacturing Engineering

Education:
Ph.D., Materials Science, MIT, 1989
M.S., Ceramics and Materials Science, CWRU, 1985
B.Tech., Mechanical Engineering, IIT, New Delhi, India, 1982

Employment:

1990 -	Assistant Professor, Manufacturing Engineering, Boston University
1989 - 90	Postdoctoral Researcher, Los Alamos National Laboratory
1984, 89	Research Assistant, MIT
1982 - 84	Research Assistant, CWRU

Distinctions:
Recipient of National Science Talent Award, India
Member Sigma Xi

Selected Publications: 20 publications

1. Basu, S.N.; Carim, A.H.; and Mitchell, T.E. " A TEM Study of Microstructures in YBa$_2$Cu$_3$O$_{7-x}$ Thin Films Deposited in LaAlO$_3$ by Laser Ablation," *J. Materials Research*, 6(9), 1823 (1991).
2. Basu, S.N.; Mitchell, T.E.; and Nastasi, M. "Electron Beam Iradiation Effects in Bulk YBa$_2$Cu$_3$O$_{7-x}$," *J. Apple. Physics*, 69(5), 3167 (1991).
3. Carim, A.H.; Basu, S.N.; and Muenchausen, R.E. "Dependence of Crystalline Orientation on Film Thickness Laser Ablated YBa2Cu3O7-x on LaAiO$_3$," *Appl. Phy. Lett.*, 58(8), 871 (1991).
4. Basu, S.N.; and Yurek, G.J. "Effect of Alloy Grain Size and Si Content on Oxidation of Stainless Steels in a SO$_2$-O$_2$ gas mixture," *Oxid Metals*, 35(5/6), 441 (1991).
5. Bordes, N.; Basu, S.N.; Rolett, A.D.; and Nastasi, M. "Properties of Thin Film YBa$_2$Cu$_3$O$_{7-x}$ Superconductors Grown on Ion-Irradiated SrTiO$_3$ Substrates," *Nucl. Instr. and Meth.*, B59/60, 1399 (1991).

Name: MICHAEL A. GEVELBER, Assistant Professor, Manufacturing Engineering

Education:
Ph.D., Mechanical Engineering, MIT, 1988
M.S., Mechanical Engineering, MIT, 1984
B.S., Physics, Brown University, 1978

Employment:

1988 -	Assistant Professor, Manufacturing Engineering, Boston University
1984 - 88	Research Assistant, Department of Mechanical Engineering, MIT

Distinctions:
NSF Research Initiation Award, 1989
2 patents

Research Interests:
Process control for materials manufacturing, modelling, multivariable control theory.

Selected Publications:

1. Narendra, K.S.; and Gevelber, M.A. "Modelling and Controll of Induction Plasma Deposition," *Control Methods for Manufacturing Processes*, ASME, Dyamic Systems and Controls, DSC -Vol. 28, p.7 (November 1991).
2. Gevelber, M.A. "A Geometric Analysis Method for Control Structure and System Design," *Control Methods for Manufacturing Processes*, edited by J.L. Stien, Y. Koren, J.Holmes, ASME DSC - Vol. 18, p. 123 (December 1989).
3. Gevelber, M.A.; and Stephanopolous, G. "Control and System Design for the Czochralski Crystal Growth Process," *Journal of Dynamic Systems, Measurement, and Control*, to appear March, 1993.

4. Gevelber, M.A.; Stephanopolous, G.; and Wargo, M.J. "Dynamics and Control of the Czochralski process, Part 1: Modelling and Dynamic Characterization," *Journal of Crystal Growth*, 84, 647 (1987).

Name: VINOD K. SARIN, Professor, Manufacturing Engineering

Education:
Sc.D., Metallurgy, MIT, 1971
M.S., Metallurgical Engineering, University of Michigan (Ann Arbor), 1966
B.S., Metallurgical Engineering, University of Wisconsin, 1965

Employment:	1989 -	Professor, Manufacturing Engineering, Boston University
	1983 - 89	Senior Staff Scientist, GTE Laboratories
	1977 - 83	Group Leader, Wear Resistant Material Program, GTE Laboratories
	1975 - 77	Senior Research Scientist, Adamas Carbide Corporation
	1971 - 75	Research Metallurgist, Coromant Research Center

Distinctions:
48 U.S. patents and 10 foreign patents
INCRA Research Fellow, MIT
General Electric Fellow, University of Michigan

Research Interests:

High-tech materials and coatings for use in manufacturing technology; development of surface modification techniques and processes, characterizaion of thin film properties, tribology and development of ceramic composites.

Appendix C: Relevant Funding

Department of Defense

Kaigham Gabriel	*Naval Research Laboratory*	"IPA Agreement with NRL"	2/7/92	$ 139,717
Bennett Goldberg	*Army Research Office*	"Dimensionally Self-Regulating Materials	4/1/91 - 3/31/94	$ 195,000
Robert Hohlfeld	*AFSOR*	"Application of Differential Inversion to DMSP Microwave Sounder Data"	1/5/92	$ 81,656
Mark Horenstein	*Army/Natick Labs*	"IPA Agreement: Electrostatics of Parachutes"	11/1/91	$ 29,928
Guilford Jones	*Army Research Office*	"Photophysics and Photodegradation of Laser Dyes"	9/1/89 - 12/31/92	$ 100,000
Robert Kotiuga	*AFOSR*	"Geometrical & Topological Aspects of Time Domain Antenna Synthesis"	12/1/91	$ 37,759
David Mountain	*Office of Naval Research*	"Computational Models of Representation & Storage of Temporal Sequences in Neural Networks"	1/1/92	$ 14,179
	Office of Naval Research (with A. Hubbard)	"Representation and Detection of Stochastic Acoustic Transients using Physiologically Based Models"	11/1/92	$ 120,129
Theodore Moustakas	*Office of Naval Research*	"Growth & Doping of AlGaN Films by ECR Assisted MBE"	5/1/92 - 4/30/93	$ 150,000
Kenneth J. Rothschild	*Army Research Office (DOD URI) (with G. Jones)*	"New Biophysical and Genetic Methods for Advanced Material Development"	7/1/92 - 6/30/95	$ 1,200,000
Vinod Sarin	*Army Research Office*	"Utilization of High Intensity Current to Enhance Fracture Toughness"	8/1/91	$ 42,511
	ORNL	"Adherent & Oxidation Resistant Coatings for Ceramic Substrates"	7/1/92	$ 99,808

William J. Skocpol (with P. Mankiewich, K. Ludwig)
DARPA/Office of Naval Research 8/15/90 - 7/31/93 $ 500,000
"Proximity-Coupled HTSC Materials and Devices"

DARPA via MIT 4/1/90 - 3/31/93 $ 772,000
"Consortium for Superconducting Electronics - Phase I,II,III

Johannes Smits
TII/Army 9/1/91 $ 46,296
"Integrated Micromechanical Strain Gauge"

Department of Energy

Morton Z. Hoffman
Department of Energy 8/1/92 - 7/31/95 $ 332,000
"Study of Intermediates from Transition Metal Excited State Electron Transfer Reactions"

Guilford Jones
Department of Energy 5/1/91 - 4/30/94 $ 320,000
"Photoinduced Electron Transfer in Ordered Polymers"

Alexander Lempicki
Department of Energy 7/1/90 - 6/30/93 $ 498,639
"Scintillation Materials for Medical Applications"

National Science Foundation

Rama Bansil 188,000
"Physics of Gels"

Thomas Bifano
National Science Foundation 5/1/92 $ 50,000
"REU Site: Synthesis & Processing of Materials"

National Science Foundation 6/1/92 $ 74,293
"Control of Fracture Damage in Precision Machining of Ceramics"

Richard Brower
National Science Foundation 12/01/91 $ 49,973
"H_2O in Protein Folding: Local Density Approach to Monte Carlo Simulations

Michael Caramanis (with M. Gevelber, A. Sharifnia, P. Vakili)
National Science Foundation 10/1/91 $ 190,041
"SMI: Development of a Science Base for Planning & Scheduling Manufacturing Systems"

Michael Gevelber (with V. Sarin)
National Science Foundation 9/1/92 $ 47,066
"In Situ Intelligent Materials Processing"

Bennett B. Goldberg		
National Science Foundation (PYI)	8/1/91 - 6/31/96	$ 312,500
"Interacting Electrons in Reduced Dimensions"		
Mark Horenstein		
National Science Foundation	5/1/92	$ 49,980
"REU Site: Emerging Technologies in Electrical Engineering"		
Boris Levy		
National Science Foundation	7/1/92 - 6/30/95	$ 330,000
"Particulate Heterojunction Photocatalysts: Correlation of Charge Carrier Separation Distances and Dynamics with Catalytic Activity"		
Thomas Little		
National Science Foundation	6/1/92	$ 100,000
"RIA: Enabling Technologies for Multimedia Computing"		
Karl F. Ludwig (with W. Klein)		
National Science Foundation	6/1/90 - 5/31/93	$ 377,800
"Kinetics of Phase Transformations"		
Theodore Moustakas		
National Science Foundation	6/1/91 - 6/1/94	$ 255,000
"Growth of Diamond & Cubic Boron Nitride Single Crystalline Films"		
Claudio Rebbi (with J. Porter)		
National Science Foundation	2/1/91 - 9/1/93	$ 138,000
"High-Speed Networking for the Connection Machine"		
National Science Foundation	2/1/92 - 2/1/93	$ 238,000
"Architectural Enhancement for Connection Machine Environment"		
National Science Foundation	9/1/92 - 9/31/95	$ 397,697
"Undergraduate Curriculum in Massively Parallel Computing"		
Kenneth J. Rothschild		
National Science Foundation	9/1/88 - 8/31/94	$ 591,160
"FTIR Study of Purple Membrane"		
Lawrence Ziegler		
National Science Foundation	11/15/89 - 2/28/93	$ 330,000
"Linear and Non-linear Resonance Raman Studies of Photodissociation"		

National Aeronautical and Space Agency

Supriya Chakrabarti		
NASA	7/1/91 - 6/30/94	$ 437,000
"Development of a Tool-set for Simultaneous, Multi-Site Observations of Astronomical Objects"		

NASA 9/1/91 - 8/31/94 $ 320,000
"The Berkeley Colliding Photoionization Solar Spectrometer"

NASA 3/1/91 - 4/30/93 $ 347,000
"A Sounding rocket Program in Extreme and Far UV Interferometry"

Anton Mavretic
NASA 10/1/91 $ 25,000
"Noise Characterization of Bergen Chip "HUGIN""

NASA via MIT 10/1/91 $ 25,000
Faraday Cup Subsystem "WIND" Spacecraft

Environmental Protection Agency

Guilford Jones
Environmental Protection Agency 9/1/91 - 8/30/94 $ 310,705
"Photodecomposition Pathways for Organic Dyes Bound to Model Humic Materials"

Norman Lichtin
Environmental Protection Agency 8/15/92 - 8/14/94 $ 213,570
"Photopromoted Solid-Catalyzed Decomposition of Organic Vapors in Air"

National Institutes of Health

Kenneth J. Rothschild
National Institutes of Health 8/1/87 - 7/31/93 $ 700,000
"FTIR Study of Photoreceptor Membrane"

National Institutes of Health 1/1/90 - 12/25/92 $ 116,664
"Development of Biomolecular Probes based on FTIR Spectroscopy"
(SBIR with Foster Miller, Inc., Waltham MA)

National Institutes of Health 8/1/92 - 7/31/95 $ 435,568
"FTIR Spectroscopy of Isotope Labelled Membrane Proteins"

Other Agency and Corporate Funding

Scott Dunham
Semetech via MIT 9/1/91 $ 90,080
"3-D Modeling of Thermal Fabrication Processes Recognition System"

Stephen Dye
Research Corp., University of Hawaii 12/1/90 - 11/30/93 $ 178,700
"Fast Time digitizer for DUMAND-II

Roscoe Giles
IBM 2/21/92 $ 33,800
"Theoretical and Experimental Investigation of the Media of Erasable Optical Data Storage"

Robert Hohlfeld
Analogic 9/1/91 $ 13,724
"Fast Algorithms for Image Registration"

Mark Horenstein (with M. Ruane)
Spire Corp. 5/15/91 $ 7,600
"Optical Analysis of Pyroelectric Detecting Thin Films"

Floyd Humphrey
Jet Propulsion Lab 6/1/92 $ 63,566
"Micromagnetic VBL Memory"

Johannes Smits
Digital Equipment Corporation 2/6/92 $ 127,000
"A Silicon Based Contractor for Testing Bare Semiconductor Die"

Attachment 7

Documents concerning federal funding for Center for Photonics Research

DUPLICATE ORIGINAL

OFFICE OF NAVAL RESEARCH
CODE 2511:CLW
BALLSTON TOWER ONE
800 NORTH QUINCY STREET
ARLINGTON VA 22217-5660
CFDA NO.: 12.300

GRANT NO: N00014-93-1-1186
R&T PROJECT: 4124700---01

S.O. CODE: 312LO
DISBURSING CODE: N00179
AGO CODE: N66017
CAGE CODE: 3A817
P.I.: ~~Bennett Goldberg~~
Dr. Donald Fraser
(see Mod. 2)

JK
DB
CB
CK
PC

RESEARCH GRANT

GRANTEE: THE TRUSTEES OF BOSTON UNIVERSITY
OFFICE OF SPONSORED PROGRAMS
25 BUICK STREET
BOSTON, MA 02215

APPROPRIATION:

AA 9720400.1104 025 RA014 0 068342 2D 61103C R1103 000URI8 $29,000,000.00
FRC: uri8

R&T Project Code: 4124700---01, Dated: 07 JUL 1993

TOTAL AMOUNT OF GRANT: $29,000,000.00

AUTHORITY: P.L. 102-172, Title IV, RDT&E, Defense Agencies,
105 Stat. 1166-1168

GRANT SCHEDULE

1. GRANT PURPOSE: Partial funding is provided toward the construction of an interdisciplinary Center for Photonics Research on the Boston University campus. The Center shall house three separate programs: Photonic Materials, Photonic Devices and Systems, and Photonic Communications, Management, and Training. The Center will evolve as a continual resource for corporate affiliates or DOD and other laboratories that may not have access to the complete array of synthetic, analytical and fabrication equipment necessary for development of their devices and products. The funds appropriated, in the amount of $29,000,000.00, for the construction are made available as a grant only to Boston University for laboratory and other efforts associated with research, development and other programs of major importance to the Department of Defense. The work shall be in accordance with Grantee's proposal dated ~~29 MAY 1993~~ 10 MARCH 1993, entitled "Center for Photonics Research," which is incorporated herein by reference.

2. PERIOD: The Grant is for the period 01 SEP 1993 through 31 AUG 1996. (see MOD 1)

3. TERMS AND CONDITIONS: This Grant is subject to the General Terms and Conditions set forth in the attached Exhibit A entitled, "Office of Naval Research Grant General Terms and Conditions," dated AUG 1988; and to any special terms and conditions contained in this Grant schedule; and to the requirements of the attached Exhibit B.

4. PRINCIPAL INVESTIGATOR: The Principal Investigator, ~~Mr. Jon Westling~~ Dr. Donald Fraser (See Mod 2 shall be continuously responsible for the research project.

5. SCIENTIFIC OFFICER: The Scientific Officer representing the United States Government is Herschel S. Pilloff, CODE 312LO, OFFICE OF NAVAL RESEARCH, BALLSTON TOWER ONE, 800 NORTH QUINCY STREET, ARLINGTON, VIRGINIA 22217-5660. (703) 696-4223

6. ADMINISTRATIVE GRANTS OFFICER: The Administrative Grants Officer for this Grant is:
OFFICE OF NAVAL RESEARCH
RESIDENT REPRESENTATIVE
ONR MIT
495 SUMMER STREET ROOM 103
BOSTON MA 02210-2109

7. PAYMENTS: Upon acceptance of the terms and conditions of this Grant, the Grantee may submit a request for reimbursement in original (SF 270) plus two copies to the Administrative Grants Officer (AGO) for the initial payment as set forth on Attachment No. 1, Payment Schedule. This initial payment is expected to cover work during the first quarter of the first year of the Grant (and any preaward costs if applicable).

Subsequent payments will be initiated upon receipt by the AGO of the Grantee's SF 270 in accordance with the Payment Schedule on Attachment No. 1. The AGO may adjust the amounts or dates of the payments based on data contained on the Grantee's SF 270 submissions or additional information provided by the Grantee.

8. REPORTS AND REPORT DISTRIBUTION: Reports shall be furnished as specified in Attachment Number 2, entitled, "Reports and Report Distribution," of this Grant.

UNITED STATES OF AMERICA
OFFICE OF NAVAL RESEARCH
by Ann Stuart
Grants Officer

Date 21 September 1993

GRANT NO N00014-93-1-1186

ATTACHMENT NUMBER 1

Payment Schedule

AMOUNT	PAYABLE DATE
$2,351,773.00	01 SEP 1993
$2,353,770.00	01 DEC 1993
$1,526,770.00	01 MAR 1994
$10,426,770.00	01 JUN 1994
$5,364,702.00	01 SEP 1994
$1,116,701.00	01 DEC 1994
$1,116,701.00	01 MAR 1995
$1,116,701.00	01 JUN 1995
$906,528.00	01 SEP 1995
$906,528.00	01 DEC 1995
$906,528.00	01 MAR 1996
$906,528.00	01 JUN 1996

GRANT NO. N00014-93-1-1186

ATTACHMENT NUMBER 2

REPORTS AND REPORT DISTRIBUTION

REPORT TYPES

(a) Performance (Technical) Report(s) (Include letter report(s))
Frequency: ?Annual

(b) Final Technical Report, issued at completion of Grant.

(c) Final Financial Status Report (SF 269)

REPORT DISTRIBUTION

ADDRESSEES	REPORT TYPES	NUMBER OF COPIES
SCIENTIFIC OFFICER CODE: 312LO Herschel S. Pilloff OFFICE OF NAVAL RESEARCH BALLSTON TOWER ONE 800 NORTH QUINCY STREET ARLINGTON, VIRGINIA 22217-5660	(a) & (b)	3
ADMINISTRATIVE GRANTS OFFICER OFFICE OF NAVAL RESEARCH RESIDENT REPRESENTATIVE ONR MIT 495 SUMMER STREET ROOM 103 BOSTON MA 02210-2109	(a) & (b) & (c)	1
DIRECTOR, NAVAL RESEARCH LABORATORY ATTN: Code 2627 WASHINGTON, DC 20375	(a) & (b)	1
DEFENSE TECHNICAL INFORMATION CENTER BUILDING 5, CAMERON STATION ALEXANDRIA, VIRGINIA 22304-6145	(a) & (b)	2

If the Scientific Officer directs, the Grantee shall make additional distribution of technical reports in accordance with a supplemental distribution list provided by the Scientific Officer. The supplemental distribution list shall not exceed 250 addresses.

GRANT NO: N00014-93-1-1186

EXHIBIT A

OFFICE OF NAVAL RESEARCH

GRANT GENERAL TERMS AND CONDITIONS FOR EDUCATIONAL INSTITUTIONS, NONPROFIT ORGANIZATIONS, AND STATE AND LOCAL GOVERNMENT

ARTICLE

1. Federal Requirements
2. Order of Precedence
3. Administration and Cost Principles
4. Research Responsibilities
5. Amendment of Grant
6. Prior Approvals
7. Principal Investigator
8. Restrictions on Printing
9. Publications
10. Acknowledgement of Sponsorship
11. Grantee-acquired Property
12. Patent Rights
13. Rights In Technical Data and Computer Software
14. Human Subjects
15. Animal Welfare
16. Research Involving Recombinant DNA Molecules
17. Foreign Travel Approval
18. Activities Abroad
19. Civil Rights Act
20. Clean Air and Water
21. U.S. Flag Carriers
22. Security
23. Officials Not to Benefit
24. Subawards and Contracts/Subcontracts

AUGUST 1988 Revised

1. Federal Requirements

This Grant is subject to the laws and regulations of the United States. If any statute expressly prescribes policies or specific requirements that differ from the requirements, standards, provisions, or terms and conditions of this Grant, the provisions of the statute shall govern.

2. Order of Precedence

Any inconsistency or conflict in the terms and conditions specified in this Grant shall be resolved according to the following order of precedence:

1. The Grant Schedule
2. Terms and Conditions in Exhibit A of this Grant

3. Administration and Cost Principles

Applicable to this Grant, and incorporated herein by reference, are the requirements, standards, and provisions of the appropriate OMB Circulars and attachments thereto, as revised as of the effective date of this Grant, listed below. For purposes of this paragraph, the term "appropriate" is determined by the organizational nature of the Grantee (educational institution, nonprofit organization, state or local government).

(a) A-110, "Uniform Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Nonprofit Organizations".

(b) A-21 "Cost Principles for Educational Institutions"

(c) A-122 "Cost Principles for Nonprofit Organizations"

(d) A-87 "Cost Principles for State and Local Governments"

(e) A-102 "Uniform Administrative Requirements for Grants in-Aid to State and Local Governments"

(f) A-88 "Indirect Cost Rates, Audit, and Audit Follow-up at Educational Institutions"

4. Research Responsibility

The Grantee has full responsibility for the conduct of the research activity supported by this Grant, in accordance with the Grantee's proposal, and the terms and conditions specified in this Grant.

Grantees are encouraged to suggest or propose to discontinue or modify unpromising lines of investigation or to explore interesting leads which may appear during the development of the research. However, they must consult the Scientific Officer through the Administrative Grants Officer before significantly deviating from the objectives or overall program of the research originally proposed.

5. Amendment of Grant

The only method by which this Grant can be amended is by a formal, written amendment signed by either the Grants Officer or the Administrative Grants Officer. No other communications, whether oral or in writing, are valid.

6. Prior Approvals (Universities only)

The provisions of this Article are applicable to universities only.

a. All prior approvals required by OMB Circulars A-21 and A-110 are waived hereby except for the following:

    (1) Change of scope or objectives as required by Article 4 of the Terms and Conditions entitled, "Research Responsibility".

    (2) Change of key personnel as required by Article 7 of the Terms and Conditions entitled, "Principal Investigator".

    (3) Foreign travel as required by Article 17 of the Terms and Conditions entitled, "Foreign Travel Approval".

    (4) Extension of the expiration period of this Grant.

b. Preaward Costs

    (1) Grantees may incur preaward costs of up to ninety (90) days prior to the effective date of the Grant award.

    (2) Preaward costs as incurred by the Grantee must be necessary for the effective and economical conduct of the project, and the costs must be otherwise allowable in accordance with the appropriate cost principles.

    (3) Any preaward costs are made at the Grantee's risk. The incurring of preaward costs by the Grantee does not impose any obligation on the Office of Naval Research in the absence of appropriations, if an award is not subsequently made, or if an award is made for a lesser amount than the Grantee expected.

c. Unobligated Balances

In the absence of any specific notice to the contrary, Grantees are authorized to carry forward unexpended balances to subsequent funding periods.

7. Principal Investigator

Support for the project may not continue without the active direction of the Principal Investigator (PI) approved for, and identified in, this Grant. If the approved PI (1) severs his or her connection with the Grantee or (2) otherwise relinquishes active direction of the project either permanently or for a significant length of time (three months or more) then the Grantee must either:

(a) appoint a replacement PI with the approval of the Scientific Officer, or

(b) relinquish the Grant in which case the Grant shall be terminated for convenience in accordance with Attachment L of OMB's Circular A-110.

8. Restrictions on Printing

Unless otherwise authorized in writing by the Grants Officer, reports, data, or other written material produced using funds provided by this Grant and submitted hereunder shall be reproduced only by duplicating processes and shall not exceed 5,000 single page reports or a total of 25,000 pages of a multiple-page report. These restrictions do not preclude the writing, editing, preparation of manuscript or reproducible copy of related illustrative materials if required as a part of this Grant, or incidental printing such as forms or materials necessary to be used by the Grantee to respond to the terms of the Grant. To satisfy the requirements of the Defense Technical Information Center, at least one copy of each technical report submitted to the Defense Technical Information Center must be black typing or reproduction of black on white paper or suitable for reproduction by photographic techniques. Reprints of published technical articles are not within the scope of this paragraph.

9. Publications

Publications of results of the research project in appropriate professional journals is encouraged as an important method of recording and reporting scientific information. One copy of each paper planned for publication will be submitted to the Scientific Officer simultaneously with its submission for publication. Following publication, copies of published papers shall be submitted to the Scientific Officer.

10. Acknowledgement of Sponsorship

(a) The Grantee agrees that in the release of information relating to this Grant, such release shall include a statement to the effect that the project or effort depicted was or is sponsored by the Department of the Navy, Office of Naval Research, and that the content of the information does not necessarily reflect the position or the policy of the Government, and no official endorsement should be inferred.

(b) For the purpose of this article, information includes new releases, articles, manuscripts, brochures, advertisements, still and motion pictures, speeches, trade association proceedings, symposia, etc.

(c) Nothing in the foregoing shall affect compliance with the requirements of the clause entitled "Security".

11. Grantee-Acquired Property

Title to all nonexpendable and expendable tangible personal property purchased by the Grantee with grant funds shall be deemed to have vested in the Grantee upon purchase, unless stated otherwise in this Grant schedule.

12. Patent Rights

Patent rights are as specified in 48 CFR 227 and 252, as amended, and 37 CFR 401.14 of July 1, 1987, which titles and sections are incorporated herein by reference.

Invention disclosures are to be submitted to the Administrative Grants Officer who will forward them directly to the Counsel for Patent Matters, (Code OOCCI), Office of Naval Research, Ballston Tower One, 800 North Quincy Street, Arlington, Virginia 22217-5660. The Counsel for Patent Matters will represent the Administrative Grants Officer with regard to invention reporting matters arising under this Grant.

13. Rights in Technical Data and Computer Software

Rights in Technical Data and Computer Software are as specified in 48 CFR 227 and 252, as amended, incorporated in this Grant by reference.

14. Human Subjects

Grant funds may NOT be used for research that uses uninformed or non-voluntary humans as experimental subjects. The Grantee is responsible for the protection of the rights and welfare of any human subjects involved in research, development, and related activities supported by this Grant. The Grantee agrees to comply, as appropriate, with the following directive and regulations which are incorporated in the Grant by reference:

a) DoD Directive 3216.2, "Protection of Human Subjects In DoD Supported Research", 7 January 1983;

b) DHHS Regulations, "Protection of Human Subjects" (45 Code of Federal Regulations, Part 46) of 26 January 1981, as amended; and,

c) FDA Regulations (21 Code of Federal Regulations, subchapter A, D, and H).

15. Animal Welfare

Any Grantee performing research on warm blooded vertebrate animals shall comply with the Laboratory Animal Welfare Act of 1966, as amended, (7 U.S.C. 2131 et seq.), and the regulations promulgated thereunder by the Secretary of Agriculture (9 CFR, Subchapter A, Parts 1 through 4) pertaining to the care, handling, and treatment of vertebrate animals held or used for research, teaching, or other activities supported by Federal awards. In addition, the Grantee shall comply with the provisions of DoD Directive 3216.1 as implemented by SECNAVINST 3900.38b, "The Use of Animals in DoD Programs", 1 June 1984. The Grantee shall specifically address paragraph 10 of SECNAVINST 3900.38B in reference to written assurance statements and clause 52.235-7003 of the DoD Federal Acquisition Regulations Supplement. The Grantee is also expected to ensure that the guidelines described in DHHS Publication No. (NIH) 85-23, "Guide for the Care and Use of Laboratory Animals," are followed and to comply with the Government Principles for the Utilization and Care of Vertebrate Animals Used In Testing, Research, and Training" (Included as an Appendix to the NIH Guide).

16. Research Involving Recombinant DNA Molecules

Any Grantee performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules agrees by acceptance of this award to comply with the National Institutes of Health "Guidelines for Research Involving Recombinant DNA Molecules", Nov 1984 (49 FR 46266-46291) or such later revision of those guidelines as may be published in the Federal Register.

17. Foreign Travel Approval

Foreign travel requires liaison with the Scientific Officer for advance approval. Grantee is cautioned that such advance approval could require 90 days in certain situations.

18. Activities Abroad

The Grantee shall assure that project activities carried on outside the United States are coordinated as necessary with appropriate Government authorities and that appropriate licenses, permits, or approvals are obtained prior to undertaking proposed activities. The awarding agency does not assume responsibility for Grantee compliance with the laws and regulations of the country in which the activity (ies) is (are) to be conducted.

19. Civil Rights Act

Grantees shall comply with the provisions of the Civil Rights Act of 1964, as amended, and implementing regulations, and the Assurance of Compliance which the Grantee must have on file prior to award of a Grant. Said Act, as amended, and regulations are incorporated in this Grant by reference.

20. Clean Air and Water

If the amount of the Grant exceeds $100,000, the Grantee shall comply with the Clean Air Act (42 U.S.C.1857), as amended; the Water Pollution Control Act (33 U.S.C. 1251), as amended; Executive Order No. 11738; and the related regulations of the Environmental Protection Agency (40 CFR, Part 15). Said regulations, Executive Order, and Acts are incorporated in this Grant by reference.

21. U. S. Flag Carriers

The Grantee shall comply with Section 5 of the International Air Transportation Fair Competitive Practices Act of 1974; the Comptroller General's Guidelines for Implementation of said Act, March 12, 1976; and Comptroller General's Decision B-138942, clarifying the guidelines. Such Act and guidelines are incorporated into this Grant by reference.

22. Security

The Grantee shall not be granted access to classified information under this Grant. If security restrictions should happen to apply to certain aspects of the proposed research, the Grantee will be so informed. In the event that the scientific work under this Grant may need classification, or involve access to or storage of any classified data, the Government shall make a decision on the need to classify, or require such access or storage within 30 days after receipt of a written notice from the Grantee. If the decision is affirmative, the Government shall invoke the clause in OMB Circular A-110, Attachment L, paragraph 4. b. entitled, "Termination for Convenience".

23. Officials Not to Benefit

No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this Grant, or to any benefit arising from it. However, this clause does not apply to this Grant to the extent that this Grant is made with a corporation for the corporation's general benefit.

24. Subawards and Contracts/Subcontracts

The applicable Federal cost principles for subawards and contracts/subcontracts under this Grant shall be those otherwise applicable to the type of organization receiving the subaward, contract or subcontract. In addition to OMB Circular A-21, the other applicable cost principles are:

(a) OMB Circular A-122 applicable to other nonprofit organizations, except those specifically exempted by the circular.
(b) Subpart 31.2 of the Federal Acquisition Regulation (48 CFR 31.2) applicable to commercial firms and those nonprofit organizations specifically exempted from the provisions of OMB Circular A-122.
(c) OMB Circular A-87 (34 CFR 255) for state and local governments.
(d) 45 DFR 74, Appendix E, for hospitals.

GRANT NO: N00014-93-1-1186

EXHIBIT B

NEW RESTRICTIONS ON LOBBYING

(a) Definitions. As used in this clause,

"Agency", as defined in 5 U.S.C. 552(f) includes Federal executive departments and agencies as well as independent regulatory commissions and Government corporations, as defined in 31 U.S.C. 9101(1).

"Covered Federal action" means any of the following Federal actions;

(1) The awarding of any Federal contract;
(2) The making of any Federal grant;
(3) The making of any Federal loan;
(4) The entering into of any cooperative agreement; and
(5) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

Covered Federal action does not include receiving from an agency a commitment providing for the United States to insure or guarantee a loan.

"Indian tribe" and "tribal organization" have the meaning provided in Section 4 of the Indian Self-Determination and Education Assistance Act (25 U. S.C. 450B). Alaskan Natives are included under the definitions of Indian tribes in that Act.

"Influencing or attempting to influence" means making, with the intent to influence, any communication to or appearance before an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any covered Federal action.

"Local government" means a unit of government in a State and, if chartered, established, or otherwise recognized by a State for the performance of a governmental duty, including a local public authority, a special district, an intrastate district, a council of governments, a sponsor group representative organization, and any other instrumentality of a local government.

"Officer or employee of an agency" includes the following individuals who are employed by an agency:

(1) An individual who is appointed to a position in the Government under title 5, U.S. Code, including a position under a temporary appointment;
(2) A member of the uniformed services as defined in section 101(3), title 37, U.S. Code;
(3) A special Government employee as defined in section 202, title 18, U.S. Code; and,
(4) An individual who is a member of a Federal advisory committee, as defined by the Federal Advisory Committee Act, title 5, U.S. Code Appendix 2.

"Person" means an individual, corporation, company, association, authority, firm, partnership, society, State, and local government, regardless of whether such entity is operated for profit or not for profit. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Reasonable compensation" means, with respect to a regularly employed officer or employee of any person, compensation that is consistent with the normal compensation for such officer or employee for work that is not furnished to, not funded by, or not furnished in cooperation with the Federal Government.

"Reasonable payment" means, with respect to professional and other technical services, a payment in an amount that is consistent with the amount normally paid for such services in the private sector.

"Recipient" includes all contractors and subcontractors at any tier in connection with a Federal contract. The term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Regularly employed" means, with respect to an officer or employee of a person requesting or receiving a Federal contract, an officer or employee who is employed by such person for at least 130 working days within one year immediately preceding the date of the submission that initiates agency consideration of such person for receipt of such contract. An officer or employee who is employed by such person for less than 130 working days within one year immediately preceding the date of the submission that initiates agency consideration of such person shall be considered to be regularly employed as soon as he or she is employed by such person for 130 working days.

"State" means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, a territory or possession of the United States, an agency or instrumentality of a State, and a multi-State, regional, or interstate entity having governmental duties and powers.

(b) Prohibition

(1) Section 1352 of title 31, U.S. Code provides in part that no appropriated funds may be expended by the recipient of a Federal contract, grant, loan, or cooperative agreement to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) The prohibition does not apply as follows:

(i) Agency and legislative liaison by Own Employees.

(A) The prohibition on the use of appropriated funds in paragraph (1) of this section, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a Federal contract if the payment is for agency and legislative liaison activities not directly related to a covered Federal action.

(B) For purposes of paragraph (A) of this section, providing any information specifically requested by an agency or Congress is allowable at any time.

(C) For purposes of paragraph (A) of this section, the following agency and legislative liaison activities are allowable at any time only where they are not related to a specific solicitation for any covered Federal action:

(i) Discussing with an agency (including individual demonstrations) the qualities and characteristics of the person's products or services, conditions or terms of sale, and service capabilities; and,

(ii) Technical discussions and other activities regarding the application or adaptation of the person's products or services for an agency's use.

(D) For purposes of paragraph (A) of this section, the following agency and legislative liaison activities are allowable only where they are prior to formal solicitation of any covered Federal action:

(i) Providing any information not specifically requested but necessary for an agency to make an informed decision about initiation of a covered Federal action;

(ii) Technical discussions regarding the preparation of an unsolicited proposal prior to its official submission; and,

(iii) Capability presentations by persons seeking awards from an agency pursuant to the provisions of the Small Business Act, as amended by Public Law 95-507 and other subsequent amendments.

(E) Only those activities expressly authorized by paragraph (i) of this section are allowable under paragraph (i).

(ii) Professional and technical services by Own Employees.

(A) The prohibition on the use of appropriated funds, in paragraph (1) of this section, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a Federal contract or an extension, continuation, renewal, amendment, or modification of a Federal contract if payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal contract or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal contract.

(B) For purposes of paragraph (A) of this section, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this section unless they provide advice and analysis directly applying their professional or technical expertise and unless the advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this section because the lawyer is not providing professional legal services. Similarly, communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this section since the engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.

(C) Requirements imposed by or pursuant to law as condition for receiving a covered Federal award include those required by law or regulation, or reasonably expected to be required by law or regulations and any other requirements in the actual award documents.

(D) Only those services expressly authorized by paragraph (ii) of this section are allowable under paragraph (ii).

(iii) Reporting for Own Employees.

No reporting is required with respect to payments of reasonable compensation made to regularly employed officers or employees of a person.

(iv) Professional and technical services by Other than own Employees.

(A) The prohibition on the use of appropriated funds, in paragraph (1) of this section, does not apply in the case of any reasonable payment to a person, other than an officer or employee of a person requesting or receiving a covered Federal action, if the payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal contract or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal contract.

(B) For purposes of paragraph (A) of this section, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this section unless they provide advice and analysis directly applying their professional or technical expertise and unless the advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this section because the lawyer is not providing professional legal services. Similarly, communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this section since the engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.

(C) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation, or reasonably expected to be required by law or regulation, and any other requirements in the actual award documents.

(D) Persons other than officers or employees of a person requesting or receiving a covered Federal action include consultants and trade associations.

(E) Only those services expressly authorized by paragraph (iv) of this section are allowable under paragraph (iv).

(c) Disclosure

(1) Each person who requests or receives from an agency a Federal contract shall file with that agency a certification that the person has not made, and will not make, any payment prohibited by paragraph (b) of this clause.

(2) Each person who requests or receives from an agency a Federal contract shall file with that agency a disclosure form, Standard Form-LLL, "Disclosure of Lobbying Activities," if such person has made or has agreed to make any payment using nonappropriated funds (to include profits from any covered Federal action), which would be prohibited under paragraph (b) of this clause if paid for with appropriated funds.

(3) Each person shall file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by such person under paragraph (2) of this section. An event that materially affects the accuracy of the information reported includes:

(i) A cumulative increase of $25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or

(ii) A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or

(iii) A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

(4) Any person who requests or receives from a person referred to in paragraph (1) of this section a subcontract exceeding $100,000 at any tier under a Federal contract shall file a certification, and a disclosure form, if required, to the next tier above.

(5) All disclosure forms, but not certifications, shall be forwarded from tier to tier until received by the person referred to in paragraph (1) of this section. That person shall forward all disclosure forms to the agency.

(d) Agreement. In accepting any contract resulting from this solicitation, the person submitting the offer agrees not to make any payment prohibited by this clause.

(e) Penalties.

(1) Any person who makes an expenditure prohibited under paragraph (b) of this clause shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure.

(2) Any person who fails to file or amend the disclosure form to be filed or amended if required by this clause, shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

(3) Contractors may rely without liability on the representations made by their subcontractors in the certification and disclosure form.

(f) Cost allowability. Nothing in this clause is to be interpreted to make allowable or reasonable any costs which would be unallowable or unreasonable in accordance with Part 31 of the Federal Acquisition Regulation. Conversely, costs made specifically unallowable by the requirements in this clause will not be made allowable under any of the provisions of Part 31 of the Federal Acquisition Regulation.

Boston University

Comptroller's Office

CURRENT RESTRICTED FUND REPORT

BUC/GCE00017
PAGE 2973

P.I. NAME: FRASER ,DONALD
EFFORT DIST: 100% ON CAMPUS, 000% OFF CAMPUS
SPONSOR: NAVY GRANTS
OFF CAMPUS LOC:
SPONSOR NO: N00014-93-1-1186
BUDGET PERIOD: 09/01/93 TO 08/31/96

UNIT-DEPARTMENT	PERIOD ENDING
PHOTONICS RESEARCH CENTER	10/31/94

FUND	UNIT DEPT	SOURCE
0	046 370	8977 5

OBJECT CODE	GROUP NO	EFFECTIVE DATE	TXN ID NO.			REFERENCE NUMBER	DESCRIPTION	BUDGET	ACTUAL	UNDERBUDGET OVERBUDGET (-)
			TYPE	ORIG	SOURCE DOC NO.					
0900							1994 BUDGET BALANCE FORWARD	844,261.00		
0900							1994 EXPENSE BALANCE FORWARD		84,886.37	
0900	P0329	07/29/94	P		002418	P 002418	0135-32-4439/FRASER, DONALD C		11,250.00	
0900	P0329	07/29/94	P		002418	P 002418	0034-52-2484/VAUDO, ROBERT P		1,166.66	
0900	P0331	08/31/94	P		002418	P 002418	0135-32-4439/FRASER, DONALD C		11,250.00	
0900	P0331	08/31/94	P		002418	P 002418	0034-52-2484/VAUDO, ROBERT P		1,166.66	
0900	P0514	09/14/94	R		002418		0034522484 VAUDO 940729		1,750.00	
0900	P0514	09/14/94	R		002418		0034522484 VAUDO 940831		1,750.00	
0900	P0330	09/30/94	P		002418	P 002418	0033-32-1684/CLARKE, RICHARD		3,450.00	
0900	P0330	09/30/94	P		002418	P 002418	0033-32-1684/CLARKE, RICHARD		1,150.00	
0900	P0330	09/30/94	P		002418	P 002418	0036-48-5279/DEJESUS, STEPHEN		3,000.00	
0900	P0330	09/30/94	P		002418	P 002418	0135-32-4439/FRASER, DONALD C		11,250.00	
0900	P0330	09/30/94	P		002418	P 002418	0019-34-9476/KINCAID, THOMAS		3,412.50	
0900	P0330	09/30/94	P		002418	P 002418	0019-34-9476/KINCAID, THOMAS		1,137.50	
0900	P0330	09/30/94	P		002418	P 002418	0034-52-2484/VAUDO, ROBERT P		2,916.66	
0900	P0519	10/19/94	R		002418		0566576216 SMITS 940930		3,277.50	
0900	P0331	10/31/94	P		002418	P 002418	0033-32-1684/CLARKE, RICHARD		3,450.00	
0900	P0331	10/31/94	P		002418	P 002418	0033-32-1684/CLARKE, RICHARD		1,150.00	
0900	P0331	10/31/94	P		002418	P 002418	0036-48-5279/DEJESUS, STEPHEN		3,000.00	
0900	P0331	10/31/94	P		002418	P 002418	0135-32-4439/FRASER, DONALD C		11,250.00	
0900	P0331	10/31/94	P		002418	P 002418	0019-34-9476/KINCAID, THOMAS		3,412.50	
0900	P0331	10/31/94	P		002418	P 002418	0019-34-9476/KINCAID, THOMAS		1,137.50	
0900	P0331	10/31/94	P		002418	P 002418	0566-57-6216/SMITS, JOHANNES		2,458.12	
0900	P0331	10/31/94	P		002418	P 002418	0566-57-6216/SMITS, JOHANNES		819.37	
0900	P0331	10/31/94	P		002418	P 002418	0034-52-2484/VAUDO, ROBERT P		2,916.66	
							INSTR. & RES. FULL-TIME	844,261.00	172,408.00	671,853.00
0901							1994 BUDGET BALANCE FORWARD	118,065.00		
0901							1994 EXPENSE BALANCE FORWARD		11,066.22	
0901	P0405	08/05/94	P		002418	P 002418	0019-34-9476/KINCAID, THOMAS		5,055.55	
0901	P0331	08/31/94	P		002418	P 002418	0139-60-1357/BIFANO, THOMAS G		6,111.11	
0901	P0331	08/31/94	P		002418	P 002418	0399-44-6724/HUBBARD, ALLYN E		6,505.55	
0901	P0331	08/31/94	P		002418	P 002418	0019-34-9476/KINCAID, THOMAS		3,217.35	
0901	P0331	08/31/94	P		002418	P 002418	0019-34-9476/KINCAID, THOMAS		1,838.20	
0901	P0331	08/31/94	P		002418	P 002418	0170-44-5576/MOUSTAKAS, THEOD		5,211.11	
0901	P0331	08/31/94	P		002418	P 002418	0534-70-3315/WURSTELL, WILLIA		5,000.00	
0901	P0514	09/14/94	R		002418		0170445576 MOUSTAKAS 940729		1,460.41	
							INSTR.& RES PART-TIME & SUPP	118,065.00	45,465.50	72,599.50

PLEASE REVIEW THIS REPORT CAREFULLY. OVEREXPENDITURES ARE SUBJECT TO BE CHARGED TO THE UNRESTRICTED DEPARTMENTAL BUDGETS.

TXN TYPE	
A	ACCOUNTS PAYABLE
B	BUDGET APPROPS
C	CASH RECEIPTS
D	BUILDINGS & GROUNDS
J	JOURNAL ENTRY
M	MISC RECEIVABLE
P	PAYROLL
T	COST TRANSFER
Z	ALLOCATION

Boston University

Comptroller's Office

CURRENT RESTRICTED FUND REPORT

BUC/GCE00017
PAGE 2974

P.I. NAME: FRASER ,DONALD
EFFORT DIST: 100% ON CAMPUS, 000% OFF CAMPUS
SPONSOR: NAVY GRANTS
OFF CAMPUS LOC:
SPONSOR NO: N00014-93-1-1186
BUDGET PERIOD: 09/01/93 TO 08/31/96

UNIT-DEPARTMENT	PERIOD ENDING
PHOTONICS RESEARCH CENTER	10/31/94

FUND	UNIT DEPT	SOURCE
0	046 370	8977 5

OBJECT CODE	GROUP NO.	EFFECTIVE DATE	TXN ID NO			REFERENCE NUMBER	DESCRIPTION	BUDGET	ACTUAL	UNDERBUDGET OVERBUDGET (-)
			TYPE	ORIG	SOURCE DOC NO					
0902							1994 BUDGET BALANCE FORWARD	400,512.00		
0902							1994 EXPENSE BALANCE FORWARD		15,322.22	
0902	P0401	07/01/94	P		002418	P 002418	0593-15-0082/RAZUMOVSKY, OLGA		1,250.00	
0902	P0408	07/08/94	P		002418	P 002418	0801-00-0870/MABROUK, AHMED A		1,666.66	
0902	P0429	07/29/94	P		002418	P 002418	0014-78-8652/CORACACIS, DIMIT		1,250.00	
0902	P0429	07/29/94	P		002418	P 002418	0457-39-3612/GOEPFERT, IAN D.		1,250.00	
0902	P0429	07/29/94	P		002418	P 002418	0801-00-0870/MABROUK, AHMED A		1,666.66	
0902	P0429	07/29/94	P		002418	P 002418	0593-15-0082/RAZUMOVSKY, OLGA		1,250.00	
0902	P0429	07/29/94	P		002418	P 002418	0175-60-1505/RHODES, GREGORY		1,250.00	
0902	P0429	07/29/94	P		002418	P 002418	0306-11-9584/SINGH, RAJMINDER		1,250.00	
0902	P0426	08/26/94	P		002418	P 002418	0014-78-8652/CORACACIS, DIMIT		1,250.00	
0902	P0426	08/26/94	P		002418	P 002418	0457-39-3612/GOEPFERT, IAN D		1,250.00	
0902	P0426	08/26/94	P		002418	P 002418	0801-00-0870/MABROUK, AHMED A		1,666.66	
0902	P0426	08/26/94	P		002418	P 002418	0306-11-9584/SINGH, RAJMINDER		1,250.00	
0902	P0507	09/07/94	R		002418		0032766090 DOPPALAPUDI 940624		400.00	
0902	P0507	09/07/94	R		002418		0161625074 MC DOWELL 940624		600.00	
0902	P0507	09/07/94	R		002418		0593150082 RAZUMOVSKY 940527		1,111.11	
0902	P0416	09/16/94	P		002418	P 002418	0593-15-0082/RAZUMOVSKY, OLGA		1,250.00	
0902	P0430	09/30/94	P		002418	P 002418	0014-78-8652/CORACACIS, DIMIT		1,250.00	
0902	P0430	09/30/94	P		002418	P 002418	0457-39-3612/GOEPFERT, IAN D		1,250.00	
0902	P0430	09/30/94	P		002418	P 002418	0077-64-2743/SAMPATH, ANAND V		1,250.00	
0902	P0430	09/30/94	P		002418	P 002418	0306-11-9584/SINGH, RAJMINDER		1,250.00	
0902	P0407	10/07/94	P		002418	P 002418	0801-00-0870/MABROUK, AHMED A		1,250.00	
0902	P0414	10/14/94	P		002418	P 002418	0033-76-6723/JADHAV, PRIYADAR		1,250.00	
0902	P0428	10/28/94	P		002418	P 002418	0014-78-8652/CORACACIS, DIMIT		1,250.00	
0902	P0428	10/28/94	P		002418	P 002418	0457-39-3612/GOEPFERT, IAN D		1,250.00	
0902	P0428	10/28/94	P		002418	P 002418	0033-76-6723/JADHAV, PRIYADAR		1,250.00	
0902	P0428	10/28/94	P		002418	P 002418	0801-00-0870/MABROUK, AHMED A		1,250.00	
0902	P0428	10/28/94	P		002418	P 002418	0802-42-7906/ORTIZ, ANDRES		1,250.00	
0902	P0428	10/28/94	P		002418	P 002418	0077-64-2743/SAMPATH, ANAND V		1,250.00	
0902	P0428	10/28/94	P		002418	P 002418	0306-11-9584/SINGH, RAJMINDER		1,250.00	
							INSTR. & RES. STUDENT	400,512.00	51,183.31	349,328.69
						SUBTOTAL	I & R SALARIES	1,362,838.00	269,056.81	1,093,781.19
0903							1994 BUDGET BALANCE FORWARD	1,313,531.00		
0903							1994 EXPENSE BALANCE FORWARD		46,141.70	
0903	P0329	07/29/94	P		002418	P 002418	0456-82-1879/BLASCHE, PAUL R		5,999.63	
0903	P0329	07/29/94	P		002418	P 002418	0502-72-0035/MEYER, BARBARA H		2,916.67	
0903	P0331	08/31/94	P		002418	P 002418	0456-82-1879/BLASCHE, PAUL R		5,999.63	

TXN TYPE	
A	ACCOUNTS PAYABLE
B	BUDGET APPROP
C	CASH RECEIPTS
G	BUILDINGS & GROUNDS
J	JOURNAL ENTRY
M	MISC RECEIVABLE
P	PAYROLL
T	COST TRANSFER
Z	ALLOCATION

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Boston University

Comptroller's Office

CURRENT RESTRICTED FUND REPORT

BUC/GCE00017
PAGE: 2975

P.I. NAME: FRASER ,DONALD
EFFORT DIST: 100% ON CAMPUS, 000% OFF CAMPUS
SPONSOR: NAVY GRANTS
OFF CAMPUS LOC:
SPONSOR NO: N00014-93-1-1186
BUDGET PERIOD: 09/01/93 TO 08/31/9

UNIT-DEPARTMENT	PERIOD ENDING	FUND	UNIT DEPT	SOURCE
PHOTONICS RESEARCH CENTER	10/31/94	0	046 370	8977 5

OBJECT CODE	GROUP NO	EFFECTIVE DATE	TXN ID NO. TYPE	ORIG	SOURCE DOC NO	REFERENCE NUMBER	DESCRIPTION	BUDGET	ACTUAL	UNDERBUDGET OVERBUDGET (*)
0903	P0331	08/31/94	P		002418	P 002418	0502-72-0035/MEYER, BARBARA H		2,916.67	
0903	P0330	09/30/94	P		002418	P 002418	0456-82-1879/BLASCHE, PAUL R		5,999.63	
0903	P0330	09/30/94	P		002418	P 002418	0502-72-0035/MEYER, BARBARA H		2,916.67	
0903	P0331	10/31/94	P		002418	P 002418	0456-82-1879/BLASCHE, PAUL R		5,999.63	
0903	P0331	10/31/94	P		002418	P 002418	0502-72-0035/MEYER, BARBARA H		2,916.67	
							ADMINISTRATION - FULL-TIME	1,313,531.00	81,806.90	1,231,724.10
0904							1994 EXPENSE BALANCE FORWARD		10,000.00	
0904	P0329	07/29/94	P		002418	P 002418	0280-60-7972/HERZOG, WILLIAM		2,500.00	
0904	P0419	08/19/94	P		002418	P 002418	0390-90-0616/TANG, DEMING		4,000.00	
0904	P0331	08/31/94	P		002418	P 002418	0036-48-5279/DEJESUS, STEPHEN		3,000.00	
0904	P0331	08/31/94	P		002418	P 002418	0036-48-5279/DEJESUS, STEPHEN		3,000.00	
0904	P0331	08/31/94	P		002418	P 002418	0280-60-7972/HERZOG, WILLIAM		2,500.00	
0904	P0330	09/30/94	P		002418	P 002418	0280-60-7972/HERZOG, WILLIAM		2,500.00	
0904	P0331	10/31/94	P		002418	P 002418	0280-60-7972/HERZOG, WILLIAM		2,500.00	
							ADMINISTRATION PART-TIME & SUP		30,000.00	30,000.00*
0905							1994 BUDGET BALANCE FORWARD	77,273.00		
							SUPPORT STAFF - FULL-TIME	77,273.00		77,273.00
0908							1994 BUDGET BALANCE FORWARD	57,955.00		
0908							1994 EXPENSE BALANCE FORWARD		496.39	
0908	P0415	07/15/94	P		002418	P 002418	0071-60-1977/ANGLAND, JOSEPH		23.93	
0908	P0422	07/22/94	P		002418	P 002418	0071-60-1977/ANGLAND, JOSEPH		31.54	
0908	P0429	07/29/94	P		002418	P 002418	0071-60-1977/ANGLAND, JOSEPH		19.58	
0908	P0429	07/29/94	P		002418	P 002418	0591-56-8686/SELVARAJ, EDWIN		83.40	
0908	P0405	08/05/94	P		002418	P 002418	0071-60-1977/ANGLAND, JOSEPH		31.54	
0908	P0405	08/05/94	P		002418	P 002418	0591-56-8686/SELVARAJ, EDWIN		208.50	
0908	P0412	08/12/94	P		002418	P 002418	0071-60-1977/ANGLAND, JOSEPH		15.23	
0908	P0412	08/12/94	P		002418	P 002418	0591-56-8686/SELVARAJ, EDWIN		189.04	
0908	P0419	08/19/94	P		002418	P 002418	0071-60-1977/ANGLAND, JOSEPH		13.05	
							STUDENTS- OTHER	57,955.00	1,112.20	56,842.80
0909							1994 BUDGET BALANCE FORWARD	55,453.00		
							CONTRACTED SERVICES-TAXABLE	55,453.00		55,453.00
						SUBTOTAL	OTHER SALARIES	1,504,212.00	112,919.10	1,391,292.90
						••••••••	TOTAL SALARIES	2,867,050.00	381,975.91	2,485,074.09

TXN TYPE	
A	ACCOUNTS PAYABLE
B	BUDGET APPROPR
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CURRENT RESTRICTED FUND REPORT

BUC/GCE00017
PAGE: 2976

P.I. NAME: FRASER ,DONALD
EFFORT DIST: 100% ON CAMPUS, 000% OFF CAMPUS
SPONSOR: NAVY GRANTS
OFF CAMPUS LOC:
SPONSOR NO: N00014-93-1-1186
BUDGET PERIOD: 09/01/93 TO 08/31/96

UNIT-DEPARTMENT	PERIOD ENDING
PHOTONICS RESEARCH CENTER	10/31/94

FUND	UNIT DEPT	SOURCE
0	046 370	8977 5

OBJECT CODE	GROUP NO.	EFFECTIVE DATE	TXN ID NO. TYPE	ORIG	SOURCE DOC NO	REFERENCE NUMBER	DESCRIPTION	BUDGET	ACTUAL	UNDERBUDGET OVERBUDGET (-)
0910							1994 BUDGET BALANCE FORWARD	310,692.00		
0910							1994 EXPENSE BALANCE FORWARD		4,776.77	
0910	0201	07/01/94	A			DP085322P4	FLOUROWARE 103822		142.00	
0910	0212	07/12/94	A			DP085324P4	MOLECULAR PROBES 19236		145.00	
0910	0212	07/12/94	A			392780	CREE RESEARCH, IN 63761		1,587.00	
0910	0212	07/12/94	A			399608	DOE & INGALLS INC 3080		47.65	
0910	0215	07/15/94	A			DP085321P4	SPI SUPPLIES 41433		34.70	
0910	0225	07/25/94	A			DP085334P4	JOHNSON MATTHEY 41258		69 66	
0910	0225	07/25/94	A			LC009351P	SIGMA CHEMICAL CO 8564		101.65	
0910	0226	07/26/94	A			DP085333P4	MACISAAC PRODUCTS 15552 BY1		78.09	
0910	0226	07/26/94	A			DP085392P4	MACISAAC PRODUCTS 15552 BY1		20.55	
0910	0227	07/27/94	A		C23735		JOSEPH ANGLAND 88 TRV		14 77	
0910	0203	08/03/94	A			387817	TECHNIGAS OF NEW 41470		38.50	
0910	0203	08/03/94	A			387817	TECHNIGAS OF NEW 41470		106.90	
0910	0203	08/03/94	A			387817	TECHNIGAS OF NEW 41470		106.90	
0910	0203	08/03/94	A			387817	TECHNIGAS OF NEW 41470		54.95	
0910	0203	08/03/94	A			387817	TECHNIGAS OF NEW 41470		106.90	
0910	0203	08/03/94	A			387817	TECHNIGAS OF NEW 41470		54 95	
0910	0203	08/03/94	A			387817	TECHNIGAS OF NEW 41470		106.90	
0910	0203	08/03/94	A			387817	TECHNIGAS OF NEW 41470		106 90	
0910	0208	08/08/94	A			DP01879BP4	DCA 18928		302.35	
0910	0210	08/10/94	A			387798	KYOCERA INDUSTRIA 103324		2,934 00	
0910	0210	08/10/94	A			387817	TECHNIGAS OF NEW 41470		158 85	
0910	0212	08/12/94	A			387817	TECHNIGAS OF NEW 41470		158.85	
0910	0212	08/12/94	A			387817	TECHNIGAS OF NEW 41470		106.90	
0910	0212	08/12/94	A			387817	TECHNIGAS OF NEW 41470		54 95	
0910	0215	08/15/94	A			392796	ANIXTER BROTHERS 62005		115.18	
0910	0216	08/16/94	A			392792	NEWPORT CORPORATI 6942		1,388 09	
0910	0216	08/16/94	A			DP085392P4	MACISAAC PRODUCTS 15552 BY1		19.95	
0910	0216	08/16/94	A			DP085394P4	MACISAAC PRODUCTS 15552 BY1		54 97	
0910	0222	08/22/94	A			387817	TECHNIGAS OF NEW 41470		158.85	
0910	0223	08/23/94	A			DP085351P4	CAMBRIDGE VALVE & 1930		116 85	
0910	0224	08/24/94	A			392796	ANIXTER BROTHERS 62005		221 20	
0910	0226	08/26/94	A			387817	TECHNIGAS OF NEW 41470		106.90	
0910	0201	09/01/94	A			DP085399P4	PERKIN-ELMER CORP 27195		452 35	
0910	0202	09/02/94	A			387817	TECHNIGAS OF NEW 41470		210 80	
0910	0206	09/06/94	A			387817	TECHNIGAS OF NEW 41470		210 80	
0910	0207	09/07/94	A			392779	MORTON INTERNATIO 103816		1,886 47	
0910	0207	09/07/94	A			392807	BIO RAD LABORATOR 43082 BY4		618 60	
0910	0207	09/07/94	A			LC009354P4	ALDRICH CHEMICAL 282		138 90	
0910	0207	09/07/94	A			LC009354P4	ALDRICH CHEMICAL 282		160 73	

TXN TYPE	
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BUC/GCE00017
PAGE 2977

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SPONSOR: NAVY GRANTS
OFF CAMPUS LOC:
SPONSOR NO N00014-93-1-1186
BUDGET PERIOD. 09/01/93 TO 08/31/96

UNIT-DEPARTMENT	PERIOD ENDING
PHOTONICS RESEARCH CENTER	10/31/94

FUND	UNIT DEPT	SOURCE
0	046 370	8977 5

OBJECT CODE	GROUP NO	EFFECTIVE DATE	TXN ID NO. TYPE	ORIG	SOURCE DOC NO	REFERENCE NUMBER	DESCRIPTION	BUDGET	ACTUAL	UNDERBUDGET OVERBUDGET (-)
0910	02080	09/08/94	A			DP085398P4	CVI-EAST 29998		366.30	
0910	02080	09/08/94	A			387817	TECHNIGAS OF NEW 41470		210.80	
0910	02080	09/08/94	A			387817	TECHNIGAS OF NEW 41470		158.85	
0910	F0084	09/09/94	T	F	193256		TECHNIGAS 6-13/6/21/6-27		838.78	
0910	F0084	09/09/94	T	F	193256		EUROTHERM/OP85282PS4/5-17-94		55.84	
0910	02090	09/09/94	A			DP085400P4	MACISAAC PRODUCTS 15552 BY1		35.87	
0910	02090	09/09/94	A			DP085400P4	MACISAAC PRODUCTS 15552 BY1		5.20	
0910	02140	09/14/94	A			LC009356P	ALDRICH CHEMICAL 282		117.90	
0910	02150	09/15/94	A			392826	MILLIPORE CORP 6372		960.25	
0910	02150	09/15/94	A			392824	FISHER SCIENTIFIC 3690		37.30	
0910	02190	09/19/94	A			387817	TECHNIGAS OF NEW 41470		106.90	
0910	02220	09/22/94	A			399674	VWR SCIENTIFIC IN 9701		728.00	
0910	02220	09/22/94	A			L073010	DOE & INGALLS INC 3080		48.04	
0910	02220	09/22/94	A			392824	FISHER SCIENTIFIC 3690		593.26	
0910	02230	09/23/94	A			DP085361P4	PERKIN ELMER 45875		204.50	
0910	02230	09/23/94	A			387817	TECHNIGAS OF NEW 41470		210.80	
0910	02230	09/23/94	A			387817	TECHNIGAS OF NEW 41470		210.80	
0910	02260	09/26/94	A			LC009355P	SIGMA CHEMICAL CO 8564		135.10	
0910	0201A	10/01/94	A			392826	MILLIPORE CORP 6372		290.50	
0910	0201B	10/01/94	A			DP023630P4	PERKIN-ELMER CORP 27195		392.35	
0910	0201B	10/01/94	A			DP023636P4	VACUUM BARRIER 46868		212.47	
0910	0201B	10/01/94	A			DP085401P4	PHARMACIA INC 7512		215.54	
0910	0201B	10/01/94	A			DP023637P4	LAB SAFETY SUPPLY 5430		50.28	
0910	0201B	10/01/94	A			DP085402P4	MACISAAC PRODUCTS 15552 BY1		47.76	
0910	0201B	10/01/94	A			387817	TECHNIGAS OF NEW 41470		210.80	
0910	0201B	10/01/94	A			387817	TECHNIGAS OF NEW 41470		158.85	
0910	02030	10/03/94	A			L073011	DOE & INGALLS INC 3080		106.48	
0910	02050	10/05/94	A			392755	NEW FOCUS INC. 78823		89.00	
0910	02050	10/05/94	A			392755	NEW FOCUS INC. 78823		89.00	
0910	02060	10/06/94	A			DP085404P4	EDMUND SCIENTIFIC 3316		398.29	
0910	02060	10/06/94	A			DP085402P4	MACISAAC PRODUCTS 15552 BY1		6.86	
0910	02060	10/06/94	A			387817	TECHNIGAS OF NEW 41470		210.80	
0910	02060	10/06/94	A			387817	TECHNIGAS OF NEW 41470		158.85	
0910	02070	10/07/94	A			DP023653P4	FISHER SCIENTIFIC3690 5		145.16	
0910	02070	10/07/94	A			DP085406P4	STAVELEY SENSORS,57658 6		428.00	
0910	02070	10/07/94	A			DP085407P4	STAVELEY SENSORS,57658 6		267.35	
0910	02070	10/07/94	A			DP023653P4	FISHER SCIENTIFIC3690 5		145.16-	
0910	02070	10/07/94	A			DP085406P4	STAVELEY SENSORS,57658 6		428.00-	
0910	02070	10/07/94	A			DP085407P4	STAVELEY SENSORS,57658 6		267.35-	
0910	02120	10/12/94	A			DP023655P4	COLE-PARMER INSTR 2380		134.19	
0910	02120	10/12/94	A			DP023654P4	NEWARK ELECTRONIC 11384		55.96	

TXN TYPE	
A	ACCOUNTS PAYABLE
B	BUDGET APPROPS
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CURRENT RESTRICTED FUND REPORT

BUC/GCE00017
PAGE 2978

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EFFORT DIST: 100% ON CAMPUS, 000% OFF CAMPUS
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OFF CAMPUS LOC:
SPONSOR NO: N00014-93-1-1186
BUDGET PERIOD: 09/01/93 TO 08/31/96

UNIT-DEPARTMENT	PERIOD ENDING
PHOTONICS RESEARCH CENTER	10/31/94

FUND	UNIT DEPT	SOURCE
0	046 370	8977 5

OBJECT CODE	GROUP NO.	EFFECTIVE DATE	TXN ID NO. TYPE	TXN ID NO. ORIG	TXN ID NO. SOURCE DOC NO	REFERENCE NUMBER	DESCRIPTION	BUDGET	ACTUAL	UNDERBUDGET OVERBUDGET (+)
0910	0212	10/12/94	A			387817	TECHNIGAS OF NEW 41470		262 75	
0910	0214	10/14/94	A			DP023663P4	CAMPUS CAMERA AND 29131		222.90	
0910	0214	10/14/94	A			387817	TECHNIGAS OF NEW 41470		210.80	
0910	0217	10/17/94	A			113453	COLE-PARMER INSTR 2380		523.20	
0910	0217	10/17/94	A			DP023654P4	NEWARK ELECTRONIC .11384		122.78	
0910	0219	10/19/94	A			DP023665P4	SELECT SALES INC. 45663		372.69	
0910	0219	10/19/94	A			LC009353P4	PHARMACIA/LKB BIO 36679 BY4		476.75	
0910	0219	10/19/94	A			DP085409P4	MACISAAC PRODUCTS 15552 BY1		55.69	
0910	0219	10/19/94	A			387817	TECHNIGAS OF NEW 41470		158.85	
0910	0221	10/21/94	A			DP023635P4	BIO-RAD LABORATOR 43082		290.30	
0910	0224	10/24/94	A			DP023654P4	NEWARK ELECTRONIC 11384		10.18	
0910	0224	10/24/94	A			387817	TECHNIGAS OF NEW 41470		158.85	
0910	0224	10/24/94	A			DP085410P4	SIGMA CHEMICAL CO 8564		306.84	
0910	0225	10/25/94	A			DP023661P4	MOLECULAR PROBES 19236		145.00	
0910	0225	10/25/94	A			DP023635P4	BIO-RAD LABORATOR 43082		32.00	
0910	0225	10/25/94	A			387817	TECHNIGAS OF NEW 41470		106.90	
0910	0225	10/25/94	A			387817	TECHNIGAS OF NEW 41470		168.11	
0910	0227	10/27/94	A			DP023664P4	BOSTON UNIVERSITY 24721		27.19	
0910	0227	10/27/94	A			399674	VWR SCIENTIFIC IN 9701		475.00	
0910	0207	10/31/94	A			DP023653P4	FISHER SCIENTIFIC 3690		145.16	
0910	0207	10/31/94	A			DP085406P4	STAVELEY SENSORS, 57658		428.00	
0910	0207	10/31/94	A			DP085407P4	STAVELEY SENSORS, 57658		267.35	
							SUPPLIES	310,692.00	30,097 04	280,594.96
0913	0210	08/10/94	A			388055	COHERENT INC. 2371		680 00	
							EQUIPMENT RENTAL		680.00	680.00*
0914	0224	10/24/94	A		T11062		AIRBORNE EXPRESS 37515		7.00	
							POSTAGE & MAIL SERVICE		7.00	7.00*
0915							1994 BUDGET BALANCE FORWARD	473,605.00		
0915							1994 EXPENSE BALANCE FORWARD		353.53	
0915	0216	08/16/94	A			DP085395P4	CERAMICS GRINDING 11650		97.50	
0915	F008 4	09/09/94	T	F	193256		RED 367-102/6/27-94/PHYSICS		200 00	
0915	0219	09/19/94	A			388065	SHAUGHNESSY CRANE 34040		785 98	
0915	F012 7	09/27/94	J	F	204460		OSBORNE/PHOTONICS LABOR 8/94		1,750 00	
0915	0201A	10/01/94	A		T09226	392798	UTT INTERNATIONAL 104282		410 00	
0915	0205	10/05/94	A			392809	AIRTRON/ DEE ASSO 102459		15.50	

TXN TYPE	
A	ACCOUNTS PAYABLE
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T	COST TRANSFER
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Boston University

Comptroller's Office

CURRENT RESTRICTED FUND REPORT

BUC/GCE00017
PAGE: 2979

P.I. NAME: FRASER ,DONALD
EFFORT DIST: 100% ON CAMPUS, 000% OFF CAMPUS
SPONSOR: NAVY GRANTS
OFF CAMPUS LOC:
SPONSOR NO: N00014-93-1-1186
BUDGET PERIOD: 09/01/93 TO 08/31/96

UNIT-DEPARTMENT	PERIOD ENDING
PHOTONICS RESEARCH CENTER	10/31/94

FUND	UNIT DEPT	SOURCE
0	046 370	8977 5

OBJECT CODE	GROUP NO.	EFFECTIVE DATE	TXN ID NO. TYPE	TXN ID NO. ORIG	TXN ID NO. SOURCE DOC NO	REFERENCE NUMBER	DESCRIPTION	BUDGET	ACTUAL	UNDERBUDGET OVERBUDGET (*)
0915	0221 0	10/21/94	A			392809	AIRTRON/ BEE ASSO 102459		30,015.50	
0915	PRM40	10/24/94	J	P	000001	00004	REVERSAL CR108537		25.00	
0915	02270	10/27/94	A			392795	RAINBOW MOVERS IN 30594		375.00	
							CONTRACTED SERVICES-OTHER	473,605.00	34,028.01	439,576.99
0916							1994 BUDGET BALANCE FORWARD	310,692.00		
0916							1994 EXPENSE BALANCE FORWARD		1,058.03	
0916	02250	07/25/94	A		B07772		AMERICAN PHYSICAL 44831		285.00	
0916	02230	08/23/94	A		B07793		AMERICAN INSTITUT 45793 BY1		495.00	
0916	F0084	09/09/94	T	F	193256		REQ 338-312/ELSEVIER/6-24-94		180.00	
0916	02040	10/04/94	A			387780	MATERIALS RESEARC 45725		900.00	
0916	02110	10/11/94	A		T09227		AMERICAN INSTITUT 45793		127.00	
							REPRODUCTION AND PRINTING	310,692.00	3,045.03	307,646.97
0917	02120	07/12/94	A		B68635		LAURIN PUBLISHING 72925		93.00	
0917	F0144	10/06/94	J	F	193148		BOOK PURCHASE VOA REQ 399686		85.94	
							BOOKS & PERIODICALS		178 94	178.94*
0918							1994 BUDGET BALANCE FORWARD	336,508.00		
0918							1994 EXPENSE BALANCE FORWARD		7,403 68	
0918	02110	07/11/94	A		B68634	392781	THOMAS BIFANO 139601357		601.00-	
0918	02110	07/11/94	A		B68634	392781	THOMAS BIFANO 139601357		699.10	
0918	02010	08/01/94	A		FRASER	392786	GARBER TRAVEL 3871		141.00	
0918	02100	08/10/94	A		BIFANO	392791	DESTINATIONS UNLI 2979		267.00	
0918	02100	08/10/94	A		BIFANO	392791	DESTINATIONS UNLI 2979		277.00	
0918	02180	08/18/94	A		C23737		COUNCIL ON COMPET 69235		295.00	
0918	02140	09/14/94	A		PORTER	392818	GARBER TRAVEL 3869		1,275.50	
0918	02150	09/15/94	A		PORTER	392818	GARBER TRAVEL 3871		1,275.50	
0918	02150	09/15/94	A		PORTER	392818	GARBER TRAVEL 3869		1,275.50-	
0918	CPR27	09/17/94	J	F	ATCO55		1122812913-REQ392812-WOC		400.00	
0918	02210	09/21/94	A		C31806	C31806	PAUL BLASCHE 456821879		400.00-	
0918	02210	09/21/94	A		C31806	C31806	PAUL BLASCHE 456821879		712 80	
0918	CR010	09/23/94	C	C	253804		TRAVEL REIMB 392786		141 00-	
0918	02270	09/27/94	A		C31811		NATIONAL SECURITY 74901		75 00	
0918	0201B	10/01/94	A		Z	392786	DONALD FRASER 135324439		141.00-	
0918	0201B	10/01/94	A		Z	392786	DONALD FRASER 135324439		141 00	
0918	02030	10/03/94	A		BLASCH	392833	GARBER TRAVEL 3871		642.50	
0918	02130	10/13/94	A		C31814	392791	THOMAS BIFANO 139601357		267 00-	

TXN TYPE	
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Boston University

Comptroller's Office

CURRENT RESTRICTED FUND REPORT

BUC/GCE00017
PAGE 2980

P.I. NAME: FRASER ,ODNALD
EFFORT DIST: 100% ON CAMPUS, 000% OFF CAMPUS
SPONSOR: NAVY GRANIS
OFF CAMPUS LOC:
SPUNSOR ND: NOOO14-93-1-1186
BUDGET PERIOD. 09/01/93 TO 08/31/96

UNIT-DEPARTMENT	PERIOD ENDING
PHOTONICS RESEARCH CENTER	10/31/94

FUND	UNIT DEPT	SOURCE
0	046 370	8977 5

OBJECT CODE	GROUP NO.	EFFECTIVE DATE	TXN ID NO TYPE	TXN ID NO ORIG	TXN ID NO SOURCE DOC NO	REFERENCE NUMBER	DESCRIPTION	BUDGET	ACTUAL	UNDERBUDGET OVERBUDGET (-)
0918	02130	10/13/94	A		C31814	392791	THOMAS BIFANO 139601357		736.21	
0918	02140	10/14/94	A			DPO85405P4	HOWARD JOHNSONS M 4658		142 61	
							TRAVEL-DOMESTIC	336,508.00	11,658.40	324,849.60
0919							1994 BUDGET BALANCE FORWARD	50,258.00		
0919							1994 EXPENSE BALANCE FORWARD		3,285.51	
0919	02130	09/13/94	A		C31804		OPTICAL SOCIETY O 37871		325.00	
0919	02220	09/22/94	A		C31802		NATIONAL ACADEMY 104634		110.00	
0919	0201B	10/01/94	A		C31803		DONALD FRASER 135324439		57.48	
							MEETING EXPENSE	50,258.00	3,777.99	46,480.01
0929	02011	08/01/94	A		TO8593		BAY STATE TAXI & 1253		17.75	
0929	02220	09/22/94	A		TO9226		BAY STATE TAXI & 1253		18.00	
0929	02270	10/27/94	A		C31813	C31813	DONALD FRASER 135324439		55.38	
							UNCLASSIFIED EXPENSE		91.13	91 13-
0930							1994 BUDGET BALANCE FORWARD	4,764,748.00		
0930							1994 EXPENSE BALANCE FORWARD		23,497.48	
0930	02120	07/12/94	A			399606	CRYO INDUSTRIES O 57687		2,949 00	
0930	02120	07/12/94	A			383632	EG&G OPTOELECTRON 102512		4,100.00	
0930	02120	07/12/94	A			392777	KAISER OPTICAL SY 103817		796.00	
0930	02250	07/25/94	A			392776	SPINDLER & HOYER, 44877		168 35	
0930	02010	08/01/94	A			392778	ANDOVER CORP 41728		207 35	
0930	02050	08/05/94	A			DPO85391P4	FJW OPTICAL SYSTE 16291		62 00	
0930	02050	08/05/94	A			DPO85391P4	FJW OPTICAL SYSTE 16291		425.00	
0930	02290	08/29/94	A			392793	GTE LABORATORIES, 75168		5,417.00	
0930	02020	09/02/94	A			392769	MICROELECTRONICS 38958		1,792.00	
0930	02070	09/07/94	A			392799	COHERENT AUBURN G 104280		598.70	
0930	02090	09/09/94	A			392805	KARL SUSS AMERICA 57138		30,439 19	
0930	02140	09/14/94	A			399627	NPC COMPUTER SYST 59031		1,625.00	
0930	02150	09/15/94	A			388057	SANTA FE LASER CO 104132		4,050 25	
0930	02150	09/15/94	A			392802	CANBERRA INDUSTRI 33859		1,023 45	
0930	0201A	10/01/94	A			399672	PLASTIC DESIGN IN 38462		1,822 50	
0930	0201A	10/01/94	A			392787	THORN EMI ELECTRO 29807		2,281 41	
0930	0201A	10/01/94	A			392823	FISHER SCIENTIFIC 3690		3,863 81	
0930	02050	10/05/94	A			392803	PLASMA-THERM, INC 104351		73,767.73	
0930	02050	10/05/94	A			392820	RADIATION MONITOR 33889		2,000 00	
0930	02130	10/13/94	A			392822	AIR PRODUCTS AND 30881		1,882.26	

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TRN TYPE	
A	ACCOUNTS PAYABLE
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Boston University

Comptroller's Office

CURRENT RESTRICTED FUND REPORT

BUC/GCE00017
PAGE: 2981

P.I. NAME: FRASER ,DONALD
EFFORT DIST: 100% ON CAMPUS, 000% OFF CAMPUS
SPONSOR: NAVY GRANTS
OFF CAMPUS LOC:
SPONSOR NO: N00014-93-1-1186
BUDGET PERIOD: 09/01/93 TO 08/31/96

UNIT-DEPARTMENT	PERIOD ENDING	FUND	UNIT-DEPT	SOURCE
PHOTONICS RESEARCH CENTER	10/31/94	0	046 370	8977 5

OBJECT CODE	GROUP NO.	EFFECTIVE DATE	TXN ID NO. TYPE	ORIG	SOURCE DOC NO	REFERENCE NUMBER	DESCRIPTION	BUDGET	ACTUAL	UNDERBUDGET OVERBUDGET (•)
0930	02210	10/21/94	A			392835	ARTISAN INDUSTRIE 104844		39,400.00	
0930	PRM40	10/24/94	J	P	000001	00004	REVERSAL CR108537		25.00-	
0930	02250	10/25/94	A			392804	HEWLETT-PACKARD 43431 BY3		26,640.00	
0930	PRM41	10/27/94	J	P	000001	00024	REVERSAL CR108932		1,023.45-	
0930	02270	10/27/94	A			392808	UNIVERSITY COMPUT 24721 BY1		2,065.00	
0930	02270	10/27/94	A			399671	MATHESON GAS PROD 41198		1,047.21	
0930	02270	10/27/94	A			399687	ACI SYSTEMS, INC. 104720		11,112.50	
0930	02270	10/27/94	A			392801	QUARTZ PLUS INC. 39709		2,605.00	
							CAPITAL EQUIPMENT/FURNISHINGS	4,764,748.00	244,589.74	4,520,158.26
0931	0531	08/31/94	B	&	G PACI	370450	590COM INSTALL 100AMP BOX		12.18	
0931	0530	09/30/94	B	&	G PACI	370450	590COM INSTALL 100AMP BOX		668.91	
							B & G SERVICES		681.09	681.09•
						SUBTOTAL	OPERATING EXPENSES	6,246,503.00	328,834.37	5,917,668.63
0953							1994 EXPENSE BALANCE FORWARD		815.57	
0953	PRM41	10/27/94	J	P	000001	00024	REVERSAL CR108932		1,023.45	
							NON'CAPITAL/MINOR EQUIPMENT		1,839.02	1,839.02•
0955	02120	07/12/94	A			399613	CREE RESEARCH, IN 63761		5,753.35	
							FABRICATED CAPITAL EQUIPMENT		5,753.35	5,753.35•
0956							1994 BUDGET BALANCE FORWARD	3,223,916.00		
0956							1994 EXPENSE BALANCE FORWARD		141,573.58	
0956	ZGIDC	07/31/94	Z	G	IDC046		I.D.C.		27,324.71	
0956	CGC17	08/16/94	J	F	DIR018		IDC ADJUST 7/94 TO 65%		1,322.16	
0956	ZGIDC	08/31/94	Z	G	IDC046		I.D.C		64,872.95	
0956	ZGIDC	09/30/94	Z	G	IDC046		I.D.C.		50,320.26	
0956	ZGIDC	10/31/94	Z	G	IDC046		I.D.C.		71,382.79	
							OVERHEAD EXPENSE	3,223,916.00	356,796.45	2,867,119.55
		ANY BUDGET BALANCE IN OBJECT CODE 0956 (OVERHEAD RECOVERY) IS NOT AVAILABLE FOR DIRECT COST USE WITHOUT								
		G.C.A. OFFICE APPROVAL.								
0957							1994 BUDGET BALANCE FORWARD	662,531.00		

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UNIT-DEPARTMENT	PERIOD ENDING	FUND	UNIT DEPT	SOURCE
PHOTONICS RESEARCH CENTER	10/31/94	0	046 370	8977 5

OBJECT CODE	GROUP NO.	EFFECTIVE DATE	TXN ID NO TYPE	ORIG	SOURCE DOC NO	REFERENCE NUMBER	DESCRIPTION	BUDGET	ACTUAL	UNDERBUDGET OVERBUDGET (-)
0957							1994 EXPENSE BALANCE FORWARD		42,738 47	
0957	ZGFB1	07/31/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		3,402.16	
0957	ZGFB1	07/31/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		2,443.06	
0957	ZGFB1	07/31/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		685.00	
0957	ZGFB1	08/31/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		3,402.16	
0957	ZGFB1	08/31/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		9,025.25	
0957	ZGFB1	08/31/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		2,443.06	
0957	ZGFB1	08/31/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		3,425.00	
0957	ZGFB1	09/30/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		8,169 76	
0957	ZGFB1	09/30/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		400.15	
0957	ZGFB1	09/30/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		2,443 06	
0957	ZGFB1	09/30/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		685.00	
0957	ZGFB1	10/31/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		9,006.83	
0957	ZGFB1	10/31/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		2,443.06	
0957	ZGFB1	10/31/94	Z		GFB01	PER	FRBN ALLOCATION-PROFESSIONAL		685.00	
							FRINGE BENEFIT EXPENSE	662,531.00	91,397.02	571,133.98
						SUBTOTAL	OTHER EXPENSE	3,886,447.00	455,785.84	3,430,661.16
						••••••••	TOTAL NON-SALARIES	10,132,950.00	784,620.21	9,348,329.79
						••••••••	TOTAL	13,000,000.00	1,166,596.12	11,833,403.88

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OFFICE OF THE DIRECTOR OF
DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3030

3 SEP 1992

Dr. John Silber
Office of the President
Boston University
Boston, MA 02215

Dear Dr. Silber:

The Department of Defense Appropriations Act, 1992 (Public Law 102-172) identified $29 million for your institution "for laboratory and other efforts associated with research, development and other programs of major importance to the Department of Defense." Subsequently, Section 302 of Public Law 102-298 made this funding subject to review by the Secretary of Defense, after which he "shall award such amounts as he deems appropriate based on the potential contribution each proposed project may make to the national scientific and technical posture."

To initiate the required review, you are invited to submit a proposal for the funding. The proposal must describe the efforts that would be undertaken, explain why they would be of major importance to the Department of Defense (DoD), and indicate how they would contribute to the national scientific and technical posture. I am enclosing copies of the current Broad Agency Announcements from the Service research offices, Strategic Defense Initiative Organization, Army Medical R&D Command, and Army Research Institute, which describe many, but not all, research areas that are deemed important to DoD and hence important to our national scientific and technical posture.

Major factors will be considered in evaluating your proposal: (1) scientific and technical merit; (2) potential benefit to defense missions; (3) qualifications of Principal Investigator and other key personnel; and (4) reasonableness of costs, when viewed in light of comparable efforts performed within DoD's university research program.

To assure that there will be ample opportunities for the review and decision process, your proposal must be sent by registered mail and be received at this office (i.e., logged-in at the Pentagon) no later than 4 p.m. local time, on November 9, 1992. A proposal approved by the institution and signed by officials and marked "ORIGINAL," along with 10 copies, must be submitted. Each copy, including all attachments, is to be typed on 8½ x 11" paper, and not more than 100 pages, all inclusive (including signature and title pages and all supporting information). Proposals must be complete and self-contained to qualify for review, and they should not be accompanied by separate attachments (such as institutional brochures or reprints), nor should they be submitted in whole or part by electronic media (computer disk, tape, facsimile machine or electronic mail).

Your proposal's content should parallel the basic information, technical information, cost information and supporting information described on page 94 of the enclosed brochure, "Office of Naval Research Guide to Programs." The rationale for any support of facilities and equipment must explain why they are essential to the proposed efforts of importance to DoD.

Each proposal will be evaluated by a panel comprised of Military Department and/or Defense Agency personnel whose areas of expertise are appropriate to the proposal's content. The results of each panel's review will be provided to the Secretary of Defense for use in making the required determination. We anticipate an award decision about 90 days after the due date of the proposal.

Sincerely,

Berlincourt

T. G. Berlincourt
Director, Research and
Laboratory Management

Enclosures

OFFICE OF THE SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

SECDEF HAS SEEN

DEC 30 1992

30 DEC 1992

MEMORANDUM FOR THE SECRETARY OF DEFENSE

THROUGH: DEPUTY SECRETARY OF DEFENSE out of town
UNDER SECRETARY OF DEFENSE FOR ACQUISITION DCf 12/30/92 ✓

FROM: DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

SUBJECT: INFORMATION --Results of Review of Certain Research-Related Projects

This memorandum presents information requested for the Secretary of Defense concerning grants under the heading "Research, Development, Test and Evaluation, Defense Agencies" (RDT&E/DA) of the Department of Defense Appropriations Act, 1992 (Public Law 102-172)("the Act").

The RDT&E/DA heading of the Act provided for grants to various institutions of higher learning "for laboratory and other efforts associated with research, development, and other programs of major importance to the Department of Defense." Section 401 of the Act, as amended by Section 302 of the Act of June 4, 1992 rescinding certain budget authority (Public Law 102-298), provided:

> "SEC. 401. Funds appropriated in this title that are directed to be made available for a grant to, or contract with, a college, foundation or university for the performance of research and development or for construction of a research or other facility shall be made available for that purpose without regard to, and (to the extent necessary) in contravention of, section 2361 of title 10, United States Code, which is hereby modified and superseded to the extent necessary to make each such grant or award each such contract, and any such grant or contract shall be made without regard to any of the conditions specified in subsection (b) of that section or section 2304 of title 10, United States Code: Provided, That the Secretary of Defense shall review grants totalling $115,900,000 and specified previously in this title and shall award such amounts as he deems appropriate based on the potential contribution each proposed project may make to the national scientific and technical posture: . . ."

A Deputy Secretary of Defense memorandum of June 9, 1992 (Tab 1) assigned the Director of Defense Research and Engineering the duty to conduct the review of grants and to inform the Secretary of Defense "of any potential contribution each proposed project reviewed may make to the national scientific and technical posture." Pursuant to that memorandum, I undertook the review of 17 proposed grants to institutions of higher learning. To assist in conducting the review, I had scientific planning groups of scientists and engineers from DOD components or members of my staff examine the proposals and provide their views on the extent to which the proposals meet the two applicable statutory standards: (1) that the grants be "for laboratory and other efforts associated with research, development, and other programs of major importance to the Department of Defense" and (2) award of the grants be "based on the potential contribution each proposed project may make to the national scientific and technical posture."

The results I received from the reviewers advising me are as follows:

Institution of Higher Learning	Amount Earmarked in Statute	Amount Reviewers Viewed Meets Both Standards
Boston University	$29.00 million	none
Brandeis University	$ 2.00 million	none
George Mason University	$ 0.75 million	$ 0.75 million (i.e., full)
Kansas State University	$ 7.70 million	$ 1.76 million (i.e., partial)
Louisiana State University	$10.00 million	none
Marywood College	$10.00 million	none
Medical College of Ohio	$ 0.25 million	none
Monmouth College	$ 2.30 million	none
NBRF (Georgetown University)	$10.00 million	none
New Mexico State University	$ 3.00 million	none
Northeastern University	$ 6.00 million	none
TRIES (Sam Houston/Austin State)	$ 5.00 million	none
University of Minnesota	$10.00 million	none
University of St. Thomas, MN	$ 0.50 million	none
University of South Carolina	$ 0.50 million	none
University of Texas, Austin	$ 6.00 million	$ 6.00 million (i.e., full)
University of Wisconsin	$ 1.60 million	$ 1.60 million (i.e., full)

The specific evaluations of the reviewers are attached. (Tab 2) I concur in their judgment that the full grants to George Mason University, University of Texas at Austin, and the University of Wisconsin, and the partial grant to Kansas State University, meet the two applicable statutory standards: (1) that the grants be "for laboratory and other efforts associated with research, development, and other programs of major importance to the Department of Defense" and (2) award of the grants be "based on the potential contribution each proposed project may make to the national scientific and technical posture."

The General Counsel of the Department of Defense concluded from a review of the specific evaluations that the reviewers may have misapplied the statutory standards in reviewing the following proposals:

> Brandeis University. The specific evaluation states that the proposal "would not be expected to contribute substantially to the national scientific posture. Funding is not recommended." The statutory standard does not require a "substantial" contribution. The information provided in the evaluation does not identify whether there is a basis for a grant "based on the potential contribution each proposed project may make to the national scientific and technical posture."
>
> Louisiana State University. The specific evaluation states that "Almost every modern University School of Medicine has a vibrant Neuroscience Center similar to the one proposed. Thus, no major contribution to the national scientific and technical posture would be provided by the addition of another such facility, and funding is not recommended." The statutory standard does not require a "major" contribution. The information provided in the evaluation does not identify whether there is a basis for a grant "based on the potential contribution

each proposed project may make to the national scientific and technical posture."

Northeastern University. The specific evaluation states that "this facility would not substantially improve DOD research or substantially contribute to the national scientific posture, and funding is not recommended." The statutory standard does require that the proposal "substantially" improve DOD research or that it "substantially" contribute to the national scientific posture. The information provided in the evaluation does not identify whether there is a basis for a grant "based on the potential contribution each proposed project may make to the national scientific and technical posture."

University of Minnesota. The specific evaluation states that the proposed basic sciences/biomedical engineering building has a cost-sharing ratio that is favorable to the government, a high quality faculty, the ability to compete successfully for research funds, and ongoing projects that are relevant to the DOD mission. The evaluation concludes: ". . . the construction of this facility would make a potential contribution to the national scientific and technical posture, but it clearly does not constitute an effort of major importance to the Department of Defense. Due to the failure to meet this latter criterion, funding of any portion of this proposal cannot be supported." The statutory standard at issue-- "for laboratory and other efforts associated with research, development, and other programs of major importance to the Department of Defense" -- would be met if the grant for the building is for laboratory and other efforts associated with research or development. The reviewers apparently considered only whether the proposed grant was for "other programs of major importance to the Department of Defense," but not whether it was for laboratory and other efforts associated with research or development.

The General Counsel advises that the funds earmarked in the statute for institutions of higher learning remain available through September 30, 1993. Thus, although the current proposals submitted by institutions may not meet the statutory standards in whole or in part, the institutions may submit any time through the end of fiscal year 1993 new proposals that, if they meet the statutory standards, can be funded.

COORDINATION: COMPT ASD/LA DOD/GC 12/30/93

SECDEF

To implement the
findings of this
DDR&E report, I
have prepared a
memo for your signature
that I recommend
(attached at Tab 3).

THE DEPUTY SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-1000

10/2/92

9 JUN 1992

MEMORANDUM FOR: SECRETARIES OF THE MILITARY DEPARTMENTS
UNDER SECRETARY OF DEFENSE FOR ACQUISITION
DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
COMPTROLLER OF THE DEPARTMENT OF DEFENSE
DIRECTORS OF DEFENSE AGENCIES

SUBJECT: Review of Certain Research-Related Projects

The Director of Defense Research and Engineering is hereby assigned the duty to conduct the review required by Section 401 of the Department of Defense Appropriations Act, 1992 (Public Law 102-172) as amended by Section 302 of the Act of June 4, 1992 rescinding certain budget authority (Public Law 102-298). After completion of that review, the Director shall inform the Secretary of Defense, through the Deputy Secretary of Defense and the Under Secretary of Defense for Acquisition, of any potential contribution each proposed project reviewed may make to the national scientific and technical posture.

D J Atwood

FINDINGS AND RECOMMENDATIONS ON FY92 EARMARKS

The 17 congressional earmarks for FY92 singled out for review were carefully reviewed by DoD experts in their respective fields, following guidelines based on Congressional language. Two requirements were set by law, *One*, taken from Public Law 102-172, that the funding be "for laboratory and other efforts associated with research, development and other programs of major importance to the Department of Defense"; and *Two*, taken from Public Law 102-298, Section 302, that the Secretary of Defense "shall award such amounts as he deems appropriate based on the potential contribution each proposed project may make to the national scientific and technical posture." These same guidelines had been conveyed in individualized letters from the Director for Research and Laboratory Management, dated 9 September 1992, inviting proposals from each of the eligible universities. The letter set the due date for proposals to be received at the Pentagon as 9 November 1992. (All were in fact received by that date). The letter stated that an award decision was anticipated about 90 days after the due date.

The expert reviews were presented at a specially convened meeting on 17 December 1992 of the Defense Committee on Research (DCOR), which consists of the directors of the Army Research Office, the Office of Naval Research, the Air Force Office of Scientific Research, and representatives from DARPA and DDR&E. Three proposals were recommended for full funding, (George Mason University, University of Texas, Austin, and the University of Wisconsin-Madison), one proposal was recommended for partial funding, (Kansas State University), and the remaining were declined because they did not meet one or both of the two requirements stated in law, and quoted above.

The seventeen reviews are presented below.

BOSTON UNIVERSITY

While the Boston University Proposal for a Photonics Research Center is well written in a stylistic sense, and well organized, it has serious problems from both a scientific and a management point of view. This proposal calls for the establishment, construction, instrumentation and staffing of still another Center for Photonics Research. The proposal identifies current problems in terms of technological limitations to the effective implementation of this new technology. Moreover, there is very little specific detail in this proposal as to what special innovative or novel approaches will be followed to advance this technology. Consequently, the research plan submitted is superficial and not unique. The currently available faculty are rather unknown in the field of photonics and the faculty to be hired are not described in any detail. For example, the project Director, Associate Director and at least half the scientific staff are not on board. Consequently, there is no way of evaluating their technical capability, nor can we evaluate if they possess the requisite skills to manage the diverse number of projects to be undertaken in this center. There is no detailed plan for continuation of this center after the three year contract and this may be due to the fact that there is no one currently in charge. No plan is given in the proposal to address competitiveness with, for example, the many excellent DARPA supported photonics centers. No case has been made for the expenditure of $16M by the federal government for a building and $4.7M for capital equipment, except that it does not currently exist. From the information submitted, it is not clear that the government would receive a fair return on its investment. Therefore, it is recommended that this proposal not be funded. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Physics).

BRANDEIS UNIVERSITY

The proposed center would provide for conduct of research of importance to the scientific community, and the work would be of high relevance to DoD programs with interests and activities in this area. Scientific progress at Brandeis would be enhanced, but reservations were expressed that work of this nature is underway in a number of other institutions also, with much the same goals and overall directions in terms of interdisciplinary technical approaches and theoretical considerations. Indeed, studies of complex systems such as the brain and intelligence require interdisciplinary cooperation no matter where conducted. For this reason, the projected center does not appear to offer a novel approach to the understanding of complex systems, nor a unique solution to the problem of individual investigators working together toward that end. It would not be expected to contribute substantially to the national scientific posture. Funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Cognitive and Neural Sciences).

GEORGE MASON UNIVERSITY

George Mason University proposes to conduct research in advanced signal processing techniques that are of great interest to DoD. Specifically GMU would acquire an Intel Paragon high performance parallel computing system, and explore and evaluate statistical signal processing techniques by implementing new algorithms on this system. This research and computer acquisition is leveraged by matching funds from GMU.

Currently used linear algorithms have been quite effective over a wide range of signal processing applications. However, these algorithms are stressed to their performance limits under conditions of low signal to noise ratios (as occurs with low observable targets), expanded bandwidth demands, and more sophisticated countermeasures. GMU proposes to use more complex algorithms (based on non-Gaussian and non-linear signal and noise models, and transient signal models) which are more computation intensive than traditional methods. Past investigations of these algorithms have shown promise of improved performance under the stressing conditions stated previously. The statistical methods proposed lend themselves to parallelization and thus present an opportunity to exploit the parallel processing architecture of the Intel Paragon. If successful, these techniques would be of great benefit to a broad set of DoD applications including ASW-related ocean surveillance, speech recognition and image processing.

Signal processing has applications in the private sector, and in other government agencies as well as DoD. The experience gained in transporting existing versions of these algorithms from vector-based supercomputers to a massively parallel processing system will be a benefit to the national scientific community. GMU collaborates with many other R&D institutions including NRL, NSWC and DARPA. GMU would make this massively parallel computing system available to support a DARPA initiative to explore the potential of educating secondary school student in high performance computing by providing hands-on experience.

This proposal addresses research in areas of major importance to DoD, and will contribute to the national scientific and technical posture. This proposal is recommended for funding. (This proposal was reviewed in the Office of the Director for Defense Research and Engineering).

KANSAS STATE UNIVERSITY

In brief, this $7.7 million proposal is essentially all for equipment and facilities (with exception of $14K for flight instructor training) associated with pilot training, aircraft maintenance, and in a minor way, test and evaluation of composite materials. A breakdown of costs is:

Piston-Engine Aircraft Purchase, Refurbishment, Etc.	$4,432,522
Piston-Engine Aircraft Flight Training Devices	274,000
Turbine-Engine Aircraft Purchase	1,588,106
Turbine-Engine Aircraft Flight Training Devices	170,000
Engine Test Cell and Purchase of Turbine Engines/Spares	490,000
Aircraft Maintenance and Repair Equipment	333,143
Aircraft Paint Station/Equipment	182,854
General Purpose Computer System	109,000
Composite Inspection and Repair Facility/Equipment	106,375
Instructor Training	14,000
TOTAL	$7,700,000

The portions of the proposal that satisfy both requirements are:

- The Turbine-Engine Aircraft Purchase (the Beechcraft C-90A King Air in Schedule C) and the Turbine-Engine Aircraft

Flight Training Device (Schedule B) -- a total of $1,758,106. KSU proposes to develop a one-month course to provide pilots leaving the military with an Airline Transport Rating. The twin-engine turboprop King Air and the associated simulator should enable KSU to implement such a course. Such an activity is associated with providing the capability for surplus military pilots to contribute to the civil sector, a program of importance of DoD. However, the potential activity is not associated with any specific DoD efforts. The emphasis here is on the interpretation of the words "associated with"; the cited portions of the proposed program will certainly not immediately satisfy Requirement #1, since there are no deliverables to DoD, any other government agency, or any private enterprise. Fulfilling the "associated with" depends on subsequent activities; although the KSU proposal would have been stronger had it included the details of the transition course, some evidence of FAA approval, and some indication of related negotiations with DoD, it is difficult to argue that the activity is not "associated with" a program of importance to DoD. On this basis, Requirement #1 is judged to be satisfied. In as much as piloting an aircraft has a significant technical component, the proposed effort would contribute to the national technical posture, and hence Requirement #2 is satisfied.

With regard to the other portions of the proposed program, it is difficult to support a conclusion that they satisfy Requirement #1. Again, these portions would provide no deliverables; any benefits to DoD depend upon subsequent activities, for which no details are offered. KSU suggests that these future potential benefits are:

- Piston-Engine Aircraft Purchase, Refurbishment, Etc. (Schedules C (except purchase of King Air), part of M,O, and P) and Flight Training Devices (Schedules F and I) will enable KSU to : continue to participate in the development of international standards for flight training; and conduct unspecified research in aviation training techniques, flight screening, and other aspects of flight training. However, the primary reason for the purchase of the equipment is to enable KSU to offer general aviation pilot training to classes of 300 student size. Although there is no doubt that pilot training is a subject of major importance to DoD, the civil-sector training of general aviation pilots is not an activity of major importance to DoD--the relative knowledge and skills required are much different. Thus, Requirement #1 is not satisfied.

- Engine Test Cell and Purchase of Engines/Spares (schedules A and G) will enable KSU to: test and evaluate the composite materials in turbine blades. Composite materials for turbine blades is certainly an emerging technology of major importance to DoD; but no specific program is proposed, and DoD and the engine manufactures already have many superior facilities--indeed, perhaps too many--to evaluate turbine blades. Accordingly, the existence of the test cell is not associated with a program of major importance to DoD, nor is the rather vague reference in the proposal for endurance testing of unspecified composite materials in unspecified turbine engines.

- Aircraft Maintenance and Repair Equipment (Schedules H, K, and Q) will enable KSU to increase their capabilities in the training of certified airframe and powerplant mechanics and certified avionics technicians; there are vague reference in the proposal to existing and potential arrangements with DoD, but the details are not adequate to permit evaluation. The training of personnel skilled in the repair and maintenance of military aircraft is a subject of major importance to DoD; but the civil-sector training of personnel in the repair and maintenance of general aviation aircraft is not an activity of major importance to DoD--the complexity of the equipment and the relative skills and knowledge required are much different.

- Aircraft Paint Station (Schedule L)--no specific benefits associated with this facility were identified by KSU. It is not associated with any program of major importance to DoD.

- Instructor Training (Part of Schedule M)--no specific benefits associated with this activity were identified by KSU. It does not appear to be associated with any program of major importance to DoD.

- The Composite Inspection and Repair Facility Equipment (Schedules D and E) and the General Purpose Computer System (Schedule J) will enable KSU to provide training to students in the inspection and repair of composite materials. The development, inspection, and repair of composite materials for aircraft is of major importance to DoD. However, the proposal makes it clear that the primary purpose of these purchases is for the teaching of students in inspection and repair techniques presumably related to general aviation aircraft; such activities would contribute to the national technical posture, but are not of major importance to DoD.

In summary, funding of no more than $1,758,106 is recommended. (This proposal was reviewed in the Office of the Director for Defense Research and Engineering).

LOUISIANA STATE UNIVERSITY MEDICAL CENTER

There is a lot of collaborative neuroscience research already being conducted among faculty members at LSU. It is difficult to see how such extensive collaboration described on page 18 of the proposal could be increased by putting individuals together on the same floor. Almost every modern University School of Medicine has a vibrant Neuroscience Center similar to the one proposed. Thus, no major contribution to the national scientific and technical posture would be provided by the addition of another such facility, and funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Biological & Medical Sciences).

MARYWOOD COLLEGE

The specific research projects proposed by Marywood College are only of tangential interest to the DoD, are not well conceptualized and offer only marginal benefit to defense missions. The type of sociological and psychological research proposed is commonplace and is currently being conducted at several universities. The work proposed would not contribute in any significant way to the national scientific and technical posture. The proposal should not be funded. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Cognitive and Neural Sciences, and a representative from the Office of the Assistant Secretary for Force Management and Personnel).

MEDICAL COLLEGE OF OHIO

This proposal requests $250,000 for one year to plan and set-up a Center for Environmental Medicine. The proposal does not identify the next step after making plans. Who would provide funds for creating the center? The proposal addresses some areas of current interest to DoD. However, many similar Centers for Environmental Medicine are in existence. Such Centers are commonplace at all major Medical Colleges. Thus, establishing another such center at the Medical College of Ohio would not contribute in a significant way to the national scientific and technical posture. There is nothing in the proposal that is unique, or that would make this center of major importance to DoD. Funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Environmental Quality Science).

MONMOUTH COLLEGE

While this proposal addresses the mutual needs of the Monmouth College/Fort Monmouth collaborative plan for focused education and training, it does not appear to be a serious contender for research dollars. There are many other institutions capable of developing a similar or perhaps better overall program. The proposal does not make a convincing case that the resulting work would offer any significant contribution to improving the national S&T posture. Funding cannot be recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Cognitive and Neural Sciences).

NATIONAL BIOMEDICAL RESEARCH FOUNDATION

The proposal requests $10M for construction of new laboratory space at Georgetown University Medical Center. This addition would enhance biomedical research capabilities at Georgetown University in areas of research of interest to DoD. Areas of research being addressed are not of critical importance to the Veteran's Administration. Most US Medical Schools have similar broad programs of research. Thus, this proposal is not unique and another building would not contribute in a significant way to the national scientific and technical posture. Although funding is not recommended, it was noted that Georgetown has a high-quality biomedical staff, and might contribute to specific DoD needs. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Biological & Medical Sciences, and by the Veterans Administration).

NEW MEXICO STATE UNIVERSITY

The very small amount of R&D to be done would have a negligible effect on national scientific capabilities. As noted in the proposal itself, achievement of its goals is impossible during the proposed two-year period of performance. The proposed activities are intended to enable small businesses in the Southwest to adopt agile manufacturing techniques. However, the proposal is unconvincing in articulating the ability of NMSU to achieve that objective, and it is also unconvincing with respect to any significant benefit to DoD. The proposal clearly attempts to establish the groundwork for a $46M out-year expenditure to construct a new building, but it provides no strong rationale as to why such a building would improve R&D capabilities or provide a valuable national resource. Therefore, funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Manufacturing Science).

NORTHEASTERN UNIVERSITY

Northeastern University is facility poor, and the building of a new facility to alleviate overcrowding in the labs would benefit Northeastern researchers who have received selective DoD support in the past, and will likely do so in the future. The funding requested for a new facility could increase the university's chances for future funding, and the effectiveness of the research performed. However, this facility would not substantially improve DoD research or substantially contribute to the national scientific posture, and funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Materials Technology).

TEXAS REGIONAL INSTITUTE FOR ENVIRONMENTAL STUDIES

This proposal requests $5M to train personnel for long term monitoring and management of the environment. The proposal is vague, actual services to DoD not clear, and the faculty involved has a weak track record in this area. Most of the areas of interest identified are not of high interest to DoD (e.g. rural and agricultural issues). Other issues, which might be of interest, are described so vaguely, that it's impossible to tell if they would be useful. Many activities described duplicate work at EPA. Nothing new or unique is mentioned. This center would not contribute in a significant way to the national scientific and technical posture, and funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Environmental Quality).

UNIVERSITY OF MINNESOTA

The University of Minnesota proposed construction of a Basic Medical Sciences/Biomedical Engineering Building. Construction of the building would be on a cost-sharing basis, with $37.8M provided by the State of Minnesota, $18.9M provided by the University of Minnesota, and $10M provided by the Department of Defense. The cost sharing ratio of 5:1 is very favorable to the Department. The faculty of the University of Minnesota appears to be of high quality, and has been increasingly successful in competing for research funds during a time when national support for biomedical research has been on a plateau. Some ongoing projects are relevant to the DoD mission, and are actually funded by the Department. Other projects have limited application to our goals.

From the standpoint of the requirements of Public Law 102-172, the construction of this facility would make a potential contribution to the national scientific and technical posture, but it clearly does not constitute an effort of major importance to the Department of Defense. Due to the failure to meet this latter criterion, funding of any portion of this proposal cannot be supported. (This proposal was reviewed in the Office of the Director of Defense Research and Engineering).

UNIVERSITY OF ST. THOMAS

The reviewers found no technical arguments in favor of the proposal. There appears to be no particular innovation in the major thrust areas of the proposal, i.e., software engineering, manufacturing and management technology. As noted on p.25 of the proposal, all funds received in response to the proposal would be used to design and construct a building. Construction of the building does not satisfy either requirement. The proposed activities are much too vague to merit serious consideration for funding. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Computer Science).

UNIVERSITY OF SOUTH CAROLINA

This proposal is for $500,000 for 2 years to help DoD with environmental problems. There is nothing unique in the proposal. Many institutions provide the services proposed. No specific "problems" were identified. The center would not perform basic research (which is badly needed) but would identify new technologies produced elsewhere. DoD does not need a center to identify new technologies. All 3 services (plus DARPA) have staffs of scientists and engineers capable of evaluating new technologies, and many institutions already provide these services. Thus no significant contribution to the national scientific and technical posture can be expected to result from the proposal, and funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Environmental Quality Science).

UNIVERSITY OF TEXAS, AUSTIN

This proposal is a request for research or scientific experimentation equipment to be housed in the newly built microelectronics facility of Univ of Texas/Austin. The equipment will enhance research capabilities currently used under the Joint Services Electronics Program and numerous other DoD contract research programs. It should be mentioned that all of these research projects, which are partially described in subject proposal, are highly productive and relevant to future DoD systems in such important areas as C3I, surveillance and precision strike. At the same time, the EE Dept. boasts a successful track record of accomplishments in dual use technologies, as expressed by strong cooperative efforts with US industry. The equipment requested is currently either not available at Univ Texas/Austin or has substantially improved performance over existing equipment. The personnel to be responsible for the equipment have international stature. Thus, all evaluation criteria are met or exceeded and the reviewers conclude that this proposal is worthy of support. At the same time, the reviewers question the rationale to further enhance research facilities at a university that is known to have a comparably strong support base, a healthy faculty and broad national and international recognition. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Electronics).

UNIVERSITY OF WISCONSIN-MADISON

Concerning the importance to the Department of Defense: The proposed program directly addresses an area of great importance to the Army in particular, and to the rest of DoD in general. The work will develop the understanding and analytical tools which will enable the design and development of advanced diesel engines. These engines are essential to the high mobility, low logistics burden tactical vehicles of the future Army and other DoD components, for example, Marines, employing ground vehicles. Such engines require significant advances in engine power-to-weight, power-to-volume and specific fuel consumption in order to meet future operational goals. The diesel engine is the leading candidate for meeting such requirements, but their realization necessitates improved understanding of the controlling combustion and heat transfer processes. The proposed research addresses these needs.

Additionally, the program correctly recognizes that a comprehensive engine analysis methodology must be developed, incorporating high fidelity models of in-cylinder processes. The availability of such a model will enable economical design tradeoff studies, which are critical to diesel optimization.

Concerning the contribution to the national scientific and technical posture: over the last twenty years there has been a steady decline in the general area of engine research, and more specifically in diesel engine research. Western Europe, particularly Germany, has taken the lead in diesel innovation. The recently formed European Community Diesel Engine Consortium intends to increase this lead. There is a pressing need, identified at recent workshops held by the Army and the Department of Energy, to develop a strong diesel engine research effort within the US to strengthen our scientific and technical position in this critical field. The research group at the Univ. of Wisconsin, largely under Army sponsorship, is the US center for excellence, for diesel engine research. The funding provided by the proposed grant will strengthen and expand this capability. The proposed program addresses the most critical issues in diesel technology: the development of a comprehensive computational methodology for diesel engine analysis, in-cylinder soot formation and destruction, fuel injection, ignition and combustion, and measurement of in-cylinder flow. The scientific results and the trained researchers resulting from this program will have a major impact on the US military and commercial posture in engine technology.

Comments on facilities/equipment: the proposed equipment purchases under this grant will facilitate the acquisition of in-cylinder data and analysis of diesel engine operation using advanced measurement and computational tools. The equipment is required by and directly in support of the goals of improving diesel engine technology.

Concerns: there are two areas of concern. The first area is the collaboration with researchers from abroad, for example, from Japan. The Engine Research Center should establish mutually beneficial relationships, and should not become, unintentionally, a "tech exporter". The second area of concern is the lack of information about the continuation of efforts beyond year 1, in the event that funding for years 2 and 3 does not materialize. University based research efforts are optimal for multi-year execution, and the PI should indicate his contingency plans. Provided these concerns can be addressed, the proposal is recommended for funding. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Mechanics).

THE SECRETARY OF DEFENSE
WASHINGTON, THE DISTRICT OF COLUMBIA

December 30, 1992

MEMORANDUM FOR THE UNDER SECRETARY OF DEFENSE FOR ACQUISITION

SUBJECT: Results of Review of Certain Research-Related Projects

Based on the Director of Defense Research and Engineering's report of December 30, 1992, subject as above, and in accordance with the "Research, Development, Test and Evaluation, Defense Agencies" heading and Section 401 of the Department of Defense Appropriations Act, 1992 (Public Law 102-172), I direct as follows:

1. The Director of Defense Research and Engineering (DDR&E), in coordination with the Comptroller of the Department of Defense, shall take such action as may be necessary to make the full grants to George Mason University, University of Texas at Austin, and the University of Wisconsin, and the partial grant to Kansas State University, as identified in the DDR&E report.

2. The DDR&E shall review the proposals of Brandeis University, Louisiana State University, Northeastern University, and the University of Minnesota and advise the Secretary of Defense through the Deputy Secretary of Defense and the Under Secretary of Defense for Acquisition of his views on whether they meet the applicable statutory standards for the proposed grants.

3. The DDR&E shall notify the institutions whose proposals were reviewed in the DDR&E report, but for which this memorandum provides no grant or only a partial grant, that the funds provided in the "Research, Development, Test and Evaluation, Defense Agencies" heading of the Act remain available for obligation through September 30, 1993. The institutions may submit new proposals for the grants that, if they meet the applicable statutory standards, can be awarded prior to September 30, 1993. The DDR&E shall provide appropriate assistance to the institutions in formulating proposals that meet the applicable statutory standards.

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3010

OFFICE OF THE SECRETARY OF DEFENSE
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EXECUTIVE SUMMARY (R)

MEMORANDUM FOR THE SECRETARY OF DEFENSE
DEPUTY SECRETARY OF DEFENSE

THROUGH: UNDER SECRETARY OF DEFENSE (ACQUISITION)

FROM: DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

SUBJECT: Grant Approval Decision for Part of the Resubmitted FY 1992 University Earmarks

PURPOSE: ACTION--Determine the award amount for proposals that have completed technical evaluation.

DISCUSSION:

- Public Law 102-172, as amended by Public Law 102-298, requires SecDef to review grants totalling $115.9 million, that was earmarked for 17 specific universities for "*laboratory and other efforts associated with research, development and other programs of major importance to the Department of Defense*," and award amounts "*he deems appropriate based on the potential contribution each proposed project may make to the national scientific and technical posture.*"

- The 17 universities originally submitted proposals on November 9, 1992, which were reviewed by Scientific Planning Groups (SPGs), or ODDR&E staff technologists. The evaluations were provided to the SecDef and he issued a Decision Memorandum on December 30, 1992, on the award amounts (TAB B).

- Kansas State University, originally approved for partial funding, was subsequently approved for full funding by the DepSecDef on April 1, 1993 (TAB C).

- The unsuccessful university proposers were advised that they could submit revised or new proposals. Revised proposals have been received from 11 of the 13 unfunded universities. Revised proposals from the two other universities (Louisiana State University, and the National Biomedical Research Foundation) have not yet been received.

- Technical evaluations have been completed on eight of the eleven revised proposals. It is recommended that full funding, at the appropriated amounts, be awarded to these eight universities. These recommendations are based on the assessment of DoD Technical Components that the revised proposed projects meet the statutory requirements and have the potential to make a contribution to the national scientific and technical posture. Evaluations are at TAB D.

- The remaining three proposals (New Mexico State University, University of St. Thomas, Minnesota, and the University of South Carolina) required additional clarification and description in some areas. Discussions between the three universities and the technical components of the Department are continuing and are expected to be completed soon. Once complete, the technical findings on the remaining university proposals will be submitted.

RECOMMENDATION: ASD(LA), DoD Comptroller, and OSD(GC) coordinations are at TAB E. Recommend that you approve the awards for each of the earmarked universities listed below and sign the memorandum at TAB A.

$29.0M of $29.0M approved for Boston University

$ 2.0M of $ 2.0M approved for Brandeis University

$10.0M of $10.0M approved for Marywood College

$ 250K of $ 250K approved for the Medical College of Ohio

$ 2.3M of $ 2.3M approved for Monmouth College

$ 6.0M of $ 6.0M approved for Northeastern University

$ 5.0M of $ 5.0M approved for Texas Regional Institute for Environmental Studies (Sam Houston State University & Stephen F. Austin State University)

$10.0M of $10.0M approved for the University of Minnesota

SECDEF DECISION

__________ Award Approved for the amounts listed above.

__________ Disapproved

__________ Other: ____

Prepared by: A. McGregor/ODDR&E(RLM)/x40205/5-18-93 A.P.M.
Approved by: John M. Bachkosky/DDDR&E/x50598/5-18-93

THE SECRETARY OF DEFENSE
WASHINGTON, THE DISTRICT OF COLUMBIA

24 MAY 1993

MEMORANDUM FOR THE UNDER SECRETARY OF DEFENSE FOR ACQUISITION

SUBJECT: Results of Certain University Research-Related Proposals

Based on the Director of Defense Research and Engineering's report of May 18, 1993, subject "Grant Approval Decision for Part of the Resubmitted FY 1992 University Earmarks," in accordance with the "Research, Development, Test and Evaluation, Defense Agencies" heading and section 401 of the Department of Defense Appropriations Act, 1992, (Public Law 102-172) as amended, I direct the following:

1. The Director of Defense Research and Engineering (DDR&E), in coordination with the Comptroller of the Department of Defense, shall take such actions as may be necessary to make the grants to Boston University, Brandeis University, Marywood College, the Medical-College of Ohio, Monmouth College, Northeastern University, the Texas Regional Institute for Environmental Studies (Sam Houston State University & Stephen F. Austin State University), and the University of Minnesota, at the full amount appropriated in Public Law 102-172 based on the content of their revised proposals.

2. The DDR&E shall continue the evaluation of the proposals from Louisiana State University, the National Biomedical Research Foundation (Georgetown University), New Mexico State University, the University of St. Thomas, Minnesota, and the University of South Carolina. When evaluations are complete, the DDR&E shall submit a report on the technical findings of the university proposals.

Les Aspin

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

SECDEF HAS SEEN
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MEMORANDUM FOR THE SECRETARY OF DEFENSE

THROUGH: DEPUTY SECRETARY OF DEFENSE out of town
UNDER SECRETARY OF DEFENSE FOR ACQUISITION DCf 12/30/92

FROM: DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

SUBJECT: INFORMATION --Results of Review of Certain Research-Related Projects

This memorandum presents information requested for the Secretary of Defense concerning grants under the heading "Research, Development, Test and Evaluation, Defense Agencies" (RDT&E/DA) of the Department of Defense Appropriations Act, 1992 (Public Law 102-172)("the Act").

The RDT&E/DA heading of the Act provided for grants to various institutions of higher learning "for laboratory and other efforts associated with research, development, and other programs of major importance to the Department of Defense." Section 401 of the Act, as amended by Section 302 of the Act of June 4, 1992 rescinding certain budget authority (Public Law 102-298), provided:

> "SEC. 401. Funds appropriated in this title that are directed to be made available for a grant to, or contract with, a college, foundation or university for the performance of research and development or for construction of a research or other facility shall be made available for that purpose without regard to, and (to the extent necessary) in contravention of, section 2361 of title 10, United States Code, which is hereby modified and superseded to the extent necessary to make each such grant or award each such contract, and any such grant or contract shall be made without regard to any of the conditions specified in subsection (b) of that section or section 2304 of title 10, United States Code: Provided, That the Secretary of Defense shall review grants totalling $115,900,000 and specified previously in this title and shall award such amounts as he deems appropriate based on the potential contribution each proposed project may make to the national scientific and technical posture: . . ."

A Deputy Secretary of Defense memorandum of June 9, 1992 (Tab 1) assigned the Director of Defense Research and Engineering the duty to conduct the review of grants and to inform the Secretary of Defense "of any potential contribution each proposed project reviewed may make to the national scientific and technical posture." Pursuant to that memorandum, I undertook the review of 17 proposed grants to institutions of higher learning. To assist in conducting the review, I had scientific planning groups of scientists and engineers from DOD components or members of my staff examine the proposals and provide their views on the extent to which the proposals meet the two applicable statutory standards: (1) that the grants be "for laboratory and other efforts associated with research, development, and other programs of major importance to the Department of Defense" and (2) award of the grants be "based on the potential contribution each proposed project may make to the national scientific and technical posture."

The results I received from the reviewers advising me are as follows:

Institution of Higher Learning	Amount Earmarked in Statute	Amount Reviewers Viewed Meets Both Standards
Boston University	$29.00 million	none
Brandeis University	$ 2.00 million	none
George Mason University	$ 0.75 million	$ 0.75 million (i.e., full)
Kansas State University	$ 7.70 million	$ 1.76 million (i.e., partial)
Louisiana State University	$10.00 million	none
Marywood College	$10.00 million	none
Medical College of Ohio	$ 0.25 million	none
Monmouth College	$ 2.30 million	none
NBRF (Georgetown University)	$10.00 million	none
New Mexico State University	$ 3.00 million	none
Northeastern University	$ 6.00 million	none
TRIES (Sam Houston/Austin State)	$ 5.00 million	none
University of Minnesota	$10.00 million	none
University of St. Thomas, MN	$ 0.50 million	none
University of South Carolina	$ 0.50 million	none
University of Texas, Austin	$ 6.00 million	$ 6.00 million (i.e., full)
University of Wisconsin	$ 1.60 million	$ 1.60 million (i.e., full)

The specific evaluations of the reviewers are attached. (Tab 2) I concur in their judgment that the full grants to George Mason University, University of Texas at Austin, and the University of Wisconsin, and the partial grant to Kansas State University, meet the two applicable statutory standards: (1) that the grants be "for laboratory and other efforts associated with research, development, and other programs of major importance to the Department of Defense" and (2) award of the grants be "based on the potential contribution each proposed project may make to the national scientific and technical posture."

The General Counsel of the Department of Defense concluded from a review of the specific evaluations that the reviewers may have misapplied the statutory standards in reviewing the following proposals:

> Brandeis University. The specific evaluation states that the proposal "would not be expected to contribute substantially to the national scientific posture. Funding is not recommended." The statutory standard does not require a "substantial" contribution. The information provided in the evaluation does not identify whether there is a basis for a grant "based on the potential contribution each proposed project may make to the national scientific and technical posture."
>
> Louisiana State University. The specific evaluation states that "Almost every modern University School of Medicine has a vibrant Neuroscience Center similar to the one proposed. Thus, no major contribution to the national scientific and technical posture would be provided by the addition of another such facility, and funding is not recommended." The statutory standard does not require a "major" contribution. The information provided in the evaluation does not identify whether there is a basis for a grant "based on the potential contribution

each proposed project may make to the national scientific and technical posture."

Northeastern University. The specific evaluation states that "this facility would not substantially improve DOD research or substantially contribute to the national scientific posture, and funding is not recommended." The statutory standard does require that the proposal "substantially" improve DOD research or that it "substantially" contribute to the national scientific posture. The information provided in the evaluation does not identify whether there is a basis for a grant "based on the potential contribution each proposed project may make to the national scientific and technical posture."

University of Minnesota. The specific evaluation states that the proposed basic sciences/biomedical engineering building has a cost-sharing ratio that is favorable to the government, a high quality faculty, the ability to compete successfully for research funds, and ongoing projects that are relevant to the DOD mission. The evaluation concludes: ". . . the construction of this facility would make a potential contribution to the national scientific and technical posture, but it clearly does not constitute an effort of major importance to the Department of Defense. Due to the failure to meet this latter criterion, funding of any portion of this proposal cannot be supported." The statutory standard at issue-- "for laboratory and other efforts associated with research, development, and other programs of major importance to the Department of Defense" -- would be met if the grant for the building is for laboratory and other efforts associated with research or development. The reviewers apparently considered only whether the proposed grant was for "other programs of major importance to the Department of Defense," but not whether it was for laboratory and other efforts associated with research or development.

The General Counsel advises that the funds earmarked in the statute for institutions of higher learning remain available through September 30, 1993. Thus, although the current proposals submitted by institutions may not meet the statutory standards in whole or in part, the institutions may submit any time through the end of fiscal year 1993 new proposals that, if they meet the statutory standards, can be funded.

COORDINATION: COMPT ASD/LA DOD/GC 12/30/93

SECDEF

To implement the
findings of this
DDR&E report, I
have prepared a
memo for your signature
that I recommend
(attached at Tab 3).

THE DEPUTY SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-1000

10/27/92

9 JUN 1992

MEMORANDUM FOR: SECRETARIES OF THE MILITARY DEPARTMENTS
UNDER SECRETARY OF DEFENSE FOR ACQUISITION
DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
COMPTROLLER OF THE DEPARTMENT OF DEFENSE
DIRECTORS OF DEFENSE AGENCIES

SUBJECT: Review of Certain Research-Related Projects

The Director of Defense Research and Engineering is hereby assigned the duty to conduct the review required by Section 401 of the Department of Defense Appropriations Act, 1992 (Public Law 102-172) as amended by Section 302 of the Act of June 4, 1992 rescinding certain budget authority (Public Law 102-298). After completion of that review, the Director shall inform the Secretary of Defense, through the Deputy Secretary of Defense and the Under Secretary of Defense for Acquisition, of any potential contribution each proposed project reviewed may make to the national scientific and technical posture.

FINDINGS AND RECOMMENDATIONS ON FY92 EARMARKS

The 17 congressional earmarks for FY92 singled out for review were carefully reviewed by DoD experts in their respective fields, following guidelines based on Congressional language. Two requirements were set by law, One, taken from Public Law 102-172, that the funding be "for laboratory and other efforts associated with research, development and other programs of major importance to the Department of Defense"; and Two, taken from Public Law 102-298, Section 302, that the Secretary of Defense "shall award such amounts as he deems appropriate based on the potential contribution each proposed project may make to the national scientific and technical posture." These same guidelines had been conveyed in individualized letters from the Director for Research and Laboratory Management, dated 9 September 1992, inviting proposals from each of the eligible universities. The letter set the due date for proposals to be received at the Pentagon as 9 November 1992. (All were in fact received by that date). The letter stated that an award decision was anticipated about 90 days after the due date.

The expert reviews were presented at a specially convened meeting on 17 December 1992 of the Defense Committee on Research (DCOR), which consists of the directors of the Army Research Office, the Office of Naval Research, the Air Force Office of Scientific Research, and representatives from DARPA and DDR&E. Three proposals were recommended for full funding, (George Mason University, University of Texas, Austin, and the University of Wisconsin-Madison), one proposal was recommended for partial funding, (Kansas State University), and the remaining were declined because they did not meet one or both of the two requirements stated in law, and quoted above.

The seventeen reviews are presented below.

BOSTON UNIVERSITY

While the Boston University Proposal for a Photonics Research Center is well written in a stylistic sense, and well organized, it has serious problems from both a scientific and a management point of view. This proposal calls for the establishment, construction, instrumentation and staffing of still another Center for Photonics Research. The proposal identifies current problems in terms of technological limitations to the effective implementation of this new technology. Moreover, there is very little specific detail in this proposal as to what special innovative or novel approaches will be followed to advance this technology. Consequently, the research plan submitted is superficial and not unique. The currently available faculty are rather unknown in the field of photonics and the faculty to be hired are not described in any detail. For example, the project Director, Associate Director and at least half the scientific staff are not on board. Consequently, there is no way of evaluating their technical capability, nor can we evaluate if they possess the requisite skills to manage the diverse number of projects to be undertaken in this center. There is no detailed plan for continuation of this center after the three year contract and this may be due to the fact that there is no one currently in charge. No plan is given in the proposal to address competitiveness with, for example, the many excellent DARPA supported photonics centers. No case has been made for the expenditure of $16M by the federal government for a building and $4.7M for capital equipment, except that it does not currently exist. From the information submitted, it is not clear that the government would receive a fair return on its investment. Therefore, it is recommended that this proposal not be funded. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Physics).

BRANDEIS UNIVERSITY

The proposed center would provide for conduct of research of importance to the scientific community, and the work would be of high relevance to DoD programs with interests and activities in this area. Scientific progress at Brandeis would be enhanced, but reservations were expressed that work of this nature is underway in a number of other institutions also, with much the same goals and overall directions in terms of interdisciplinary technical approaches and theoretical considerations. Indeed, studies of complex systems such as the brain and intelligence require interdisciplinary cooperation no matter where conducted. For this reason, the projected center does not appear to offer a novel approach to the understanding of complex systems, nor a unique solution to the problem of individual investigators working together toward that end. It would not be expected to contribute substantially to the national scientific posture. Funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Cognitive and Neural Sciences).

GEORGE MASON UNIVERSITY

George Mason University proposes to conduct research in advanced signal processing techniques that are of great interest to DoD. Specifically GMU would acquire an Intel Paragon high performance parallel computing system, and explore and evaluate statistical signal processing techniques by implementing new algorithms on this system. This research and computer acquisition is leveraged by matching funds from GMU.

Currently used linear algorithms have been quite effective over a wide range of signal processing applications. However, these algorithms are stressed to their performance limits under conditions of low signal to noise ratios (as occurs with low observable targets), expanded bandwidth demands, and more sophisticated countermeasures. GMU proposes to use more complex algorithms (based on non-Gaussian and non-linear signal and noise models, and transient signal models) which are more computation intensive than traditional methods. Past investigations of these algorithms have shown promise of improved performance under the stressing conditions stated previously. The statistical methods proposed lend themselves to parallelization and thus present an opportunity to exploit the parallel processing architecture of the Intel Paragon. If successful, these techniques would be of great benefit to a broad set of DoD applications including ASW-related ocean surveillance, speech recognition and image processing.

Signal processing has applications in the private sector, and in other government agencies as well as DoD. The experience gained in transporting existing versions of these algorithms from vector-based supercomputers to a massively parallel processing system will be a benefit to the national scientific community. GMU collaborates with many other R&D institutions including NRL, NSWC and DARPA. GMU would make this massively parallel computing system available to support a DARPA initiative to explore the potential of educating secondary school student in high performance computing by providing hands-on experience.

This proposal addresses research in areas of major importance to DoD, and will contribute to the national scientific and technical posture. This proposal is recommended for funding. (This proposal was reviewed in the Office of the Director for Defense Research and Engineering).

KANSAS STATE UNIVERSITY

In brief, this $7.7 million proposal is essentially all for equipment and facilities (with exception of $14K for flight instructor training) associated with pilot training, aircraft maintenance, and in a minor way, test and evaluation of composite materials. A breakdown of costs is:

Piston-Engine Aircraft Purchase, Refurbishment, Etc.	$4,432,522
Piston-Engine Aircraft Flight Training Devices	274,000
Turbine-Engine Aircraft Purchase	1,588,106
Turbine-Engine Aircraft Flight Training Devices	170,000
Engine Test Cell and Purchase of Turbine Engines/Spares	490,000
Aircraft Maintenance and Repair Equipment	333,143
Aircraft Paint Station/Equipment	182,854
General Purpose Computer System	109,000
Composite Inspection and Repair Facility/Equipment	106,375
Instructor Training	14,000
TOTAL	$7,700,000

The portions of the proposal that satisfy both requirements are:

- The Turbine-Engine Aircraft Purchase (the Beechcraft C-90A King Air in Schedule C) and the Turbine-Engine Aircraft

Flight Training Device (Schedule B) -- a total of $1,758,106. KSU proposes to develop a one-month course to provide pilots leaving the military with an Airline Transport Rating. The twin-engine turboprop King Air and the associated simulator should enable KSU to implement such a course. Such an activity is associated with providing the capability for surplus military pilots to contribute to the civil sector, a program of importance of DoD. However, the potential activity is not associated with any specific DoD efforts. The emphasis here is on the interpretation of the words "associated with"; the cited portions of the proposed program will certainly not immediately satisfy Requirement #1, since there are no deliverables to DoD, any other government agency, or any private enterprise. Fulfilling the "associated with" depends on subsequent activities; although the KSU proposal would have been stronger had it included the details of the transition course, some evidence of FAA approval, and some indication of related negotiations with DoD, it is difficult to argue that the activity is not "associated with" a program of importance to DoD. On this basis, Requirement #1 is judged to be satisfied. In as much as piloting an aircraft has a significant technical component, the proposed effort would contribute to the national technical posture, and hence Requirement #2 is satisfied.

With regard to the other portions of the proposed program, it is difficult to support a conclusion that they satisfy Requirement #1. Again, these portions would provide no deliverables; any benefits to DoD depend upon subsequent activities, for which no details are offered. KSU suggests that these future potential benefits are:

- Piston-Engine Aircraft Purchase, Refurbishment, Etc. (Schedules C (except purchase of King Air), part of M,O, and P) and Flight Training Devices (Schedules F and I) will enable KSU to : continue to participate in the development of international standards for flight training; and conduct unspecified research in aviation training techniques, flight screening, and other aspects of flight training. However, the primary reason for the purchase of the equipment is to enable KSU to offer general aviation pilot training to classes of 300 student size. Although there is no doubt that pilot training is a subject of major importance to DoD, the civil-sector training of general aviation pilots is not an activity of major importance to DoD--the relative knowledge and skills required are much different. Thus, Requirement #1 is not satisfied.

- Engine Test Cell and Purchase of Engines/Spares (schedules A and G) will enable KSU to: test and evaluate the composite materials in turbine blades. Composite materials for turbine blades is certainly an emerging technology of major importance to DoD; but no specific program is proposed, and DoD and the engine manufactures already have many superior facilities--indeed, perhaps too many--to evaluate turbine blades. Accordingly, the existence of the test cell is not associated with a program of major importance to DoD, nor is the rather vague reference in the proposal for endurance testing of unspecified composite materials in unspecified turbine engines.

- Aircraft Maintenance and Repair Equipment (Schedules H, K, and Q) will enable KSU to increase their capabilities in the training of certified airframe and powerplant mechanics and certified avionics technicians; there are vague reference in the proposal to existing and potential arrangements with DoD, but the details are not adequate to permit evaluation. The training of personnel skilled in the repair and maintenance of military aircraft is a subject of major importance to DoD; but the civil-sector training of personnel in the repair and maintenance of general aviation aircraft is not an activity of major importance to DoD--the complexity of the equipment and the relative skills and knowledge required are much different.

- Aircraft Paint Station (Schedule L)--no specific benefits associated with this facility were identified by KSU. It is not associated with any program of major importance to DoD.

- Instructor Training (Part of Schedule M)--no specific benefits associated with this activity were identified by KSU. It does not appear to be associated with any program of major importance to DoD.

- The Composite Inspection and Repair Facility Equipment (Schedules D and E) and the General Purpose Computer System (Schedule J) will enable KSU to provide training to students in the inspection and repair of composite materials. The development, inspection, and repair of composite materials for aircraft is of major importance to DoD. However, the proposal makes it clear that the primary purpose of these purchases is for the teaching of students in inspection and repair techniques presumably related to general aviation aircraft; such activities would contribute to the national technical posture, but are not of major importance to DoD.

In summary, funding of no more than $1,758,106 is recommended. (This proposal was reviewed in the Office of the Director for Defense Research and Engineering).

LOUISIANA STATE UNIVERSITY MEDICAL CENTER

There is a lot of collaborative neuroscience research already being conducted among faculty members at LSU. It is difficult to see how such extensive collaboration described on page 18 of the proposal could be increased by putting individuals together on the same floor. Almost every modern University School of Medicine has a vibrant Neuroscience Center similar to the one proposed. Thus, no major contribution to the national scientific and technical posture would be provided by the addition of another such facility, and funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Biological & Medical Sciences).

MARYWOOD COLLEGE

The specific research projects proposed by Marywood College are only of tangential interest to the DoD, are not well conceptualized and offer only marginal benefit to defense missions. The type of sociological and psychological research proposed is commonplace and is currently being conducted at several universities. The work proposed would not contribute in any significant way to the national scientific and technical posture. The proposal should not be funded. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Cognitive and Neural Sciences, and a representative from the Office of the Assistant Secretary for Force Management and Personnel).

MEDICAL COLLEGE OF OHIO

This proposal requests $250,000 for one year to plan and set-up a Center for Environmental Medicine. The proposal does not identify the next step after making plans. Who would provide funds for creating the center? The proposal addresses some areas of current interest to DoD. However, many similar Centers for Environmental Medicine are in existence. Such Centers are commonplace at all major Medical Colleges. Thus, establishing another such center at the Medical College of Ohio would not contribute in a significant way to the national scientific and technical posture. There is nothing in the proposal that is unique, or that would make this center of major importance to DoD. Funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Environmental Quality Science).

MONMOUTH COLLEGE

While this proposal addresses the mutual needs of the Monmouth College/Fort Monmouth collaborative plan for focused education and training, it does not appear to be a serious contender for research dollars. There are many other institutions capable of developing a similar or perhaps better overall program. The proposal does not make a convincing case that the resulting work would offer any significant contribution to improving the national S&T posture. Funding cannot be recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Cognitive and Neural Sciences).

NATIONAL BIOMEDICAL RESEARCH FOUNDATION

The proposal requests $10M for construction of new laboratory space at Georgetown University Medical Center. This addition would enhance biomedical research capabilities at Georgetown University in areas of research of interest to DoD. Areas of research being addressed are not of critical importance to the Veteran's Administration. Most US Medical Schools have similar broad programs of research. Thus, this proposal is not unique and another building would not contribute in a significant way to the national scientific and technical posture. Although funding is not recommended, it was noted that Georgetown has a high-quality biomedical staff, and might contribute to specific DoD needs. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Biological & Medical Sciences, and by the Veterans Administration).

NEW MEXICO STATE UNIVERSITY

The very small amount of R&D to be done would have a negligible effect on national scientific capabilities. As noted in the proposal itself, achievement of its goals is impossible during the proposed two-year period of performance. The proposed activities are intended to enable small businesses in the Southwest to adopt agile manufacturing techniques. However, the proposal is unconvincing in articulating the ability of NMSU to achieve that objective, and it is also unconvincing with respect to any significant benefit to DoD. The proposal clearly attempts to establish the groundwork for a $46M out-year expenditure to construct a new building, but it provides no strong rationale as to why such a building would improve R&D capabilities or provide a valuable national resource. Therefore, funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Manufacturing Science).

NORTHEASTERN UNIVERSITY

Northeastern University is facility poor, and the building of a new facility to alleviate overcrowding in the labs would benefit Northeastern researchers who have received selective DoD support in the past, and will likely do so in the future. The funding requested for a new facility could increase the university's chances for future funding, and the effectiveness of the research performed. However, this facility would not substantially improve DoD research or substantially contribute to the national scientific posture, and funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Materials Technology).

TEXAS REGIONAL INSTITUTE FOR ENVIRONMENTAL STUDIES

This proposal requests $5M to train personnel for long term monitoring and management of the environment. The proposal is vague, actual services to DoD not clear, and the faculty involved has a weak track record in this area. Most of the areas of interest identified are not of high interest to DoD (e.g. rural and agricultural issues). Other issues, which might be of interest, are described so vaguely, that it's impossible to tell if they would be useful. Many activities described duplicate work at EPA. Nothing new or unique is mentioned. This center would not contribute in a significant way to the national scientific and technical posture, and funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Environmental Quality).

UNIVERSITY OF MINNESOTA

The University of Minnesota proposed construction of a Basic Medical Sciences/Biomedical Engineering Building. Construction of the building would be on a cost-sharing basis, with $37.8M provided by the State of Minnesota, $18.9M provided by the University of Minnesota, and $10M provided by the Department of Defense. The cost sharing ratio of 5:1 is very favorable to the Department. The faculty of the University of Minnesota appears to be of high quality, and has been increasingly successful in competing for research funds during a time when national support for biomedical research has been on a plateau. Some ongoing projects are relevant to the DoD mission, and are actually funded by the Department. Other projects have limited application to our goals.

From the standpoint of the requirements of Public Law 102-172, the construction of this facility would make a potential contribution to the national scientific and technical posture, but it clearly does not constitute an effort of major importance to the Department of Defense. Due to the failure to meet this latter criterion, funding of any portion of this proposal cannot be supported. (This proposal was reviewed in the Office of the Director of Defense Research and Engineering).

UNIVERSITY OF ST. THOMAS

The reviewers found no technical arguments in favor of the proposal. There appears to be no particular innovation in the major thrust areas of the proposal, i.e., software engineering, manufacturing and management technology. As noted on p.25 of the proposal, all funds received in response to the proposal would be used to design and construct a building. Construction of the building does not satisfy either requirement. The proposed activities are much too vague to merit serious consideration for funding. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Computer Science).

UNIVERSITY OF SOUTH CAROLINA

This proposal is for $500,000 for 2 years to help DoD with environmental problems. There is nothing unique in the proposal. Many institutions provide the services proposed. No specific "problems" were identified. The center would not perform basic research (which is badly needed) but would identify new technologies produced elsewhere. DoD does not need a center to identify new technologies. All 3 services (plus DARPA) have staffs of scientists and engineers capable of evaluating new technologies, and many institutions already provide these services. Thus no significant contribution to the national scientific and technical posture can be expected to result from the proposal, and funding is not recommended. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Environmental Quality Science).

UNIVERSITY OF TEXAS, AUSTIN

This proposal is a request for research or scientific experimentation equipment to be housed in the newly built microelectronics facility of Univ of Texas/Austin. The equipment will enhance research capabilities currently used under the Joint Services Electronics Program and numerous other DoD contract research programs. It should be mentioned that all of these research projects, which are partially described in subject proposal, are highly productive and relevant to future DoD systems in such important areas as C3I, surveillance and precision strike. At the same time, the EE Dept. boasts a successful track record of accomplishments in dual use technologies, as expressed by strong cooperative efforts with US industry. The equipment requested is currently either not available at Univ Texas/Austin or has substantially improved performance over existing equipment. The personnel to be responsible for the equipment have international stature. Thus, all evaluation criteria are met or exceeded and the reviewers conclude that this proposal is worthy of support. At the same time, the reviewers question the rationale to further enhance research facilities at a university that is known to have a comparably strong support base, a healthy faculty and broad national and international recognition. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Electronics).

UNIVERSITY OF WISCONSIN-MADISON

Concerning the importance to the Department of Defense: The proposed program directly addresses an area of great importance to the Army in particular, and to the rest of DoD in general. The work will develop the understanding and analytical tools which will enable the design and development of advanced diesel engines. These engines are essential to the high mobility, low logistics burden tactical vehicles of the future Army and other DoD components, for example, Marines, employing ground vehicles. Such engines require significant advances in engine power-to-weight, power-to-volume and specific fuel consumption in order to meet future operational goals. The diesel engine is the leading candidate for meeting such requirements, but their realization necessitates improved understanding of the controlling combustion and heat transfer processes. The proposed research addresses these needs.

Additionally, the program correctly recognizes that a comprehensive engine analysis methodology must be developed, incorporating high fidelity models of in-cylinder processes. The availability of such a model will enable economical design tradeoff studies, which are critical to diesel optimization.

Concerning the contribution to the national scientific and technical posture: over the last twenty years there has been a steady decline in the general area of engine research, and more specifically in diesel engine research. Western Europe, particularly Germany, has taken the lead in diesel innovation. The recently formed European Community Diesel Engine Consortium intends to increase this lead. There is a pressing need, identified at recent workshops held by the Army and the Department of Energy, to develop a strong diesel engine research effort within the US to strengthen our scientific and technical position in this critical field. The research group at the Univ. of Wisconsin, largely under Army sponsorship, is the US center for excellence, for diesel engine research. The funding provided by the proposed grant will strengthen and expand this capability. The proposed program addresses the most critical issues in diesel technology: the development of a comprehensive computational methodology for diesel engine analysis, in-cylinder soot formation and destruction, fuel injection, ignition and combustion, and measurement of in-cylinder flow. The scientific results and the trained researchers resulting from this program will have a major impact on the US military and commercial posture in engine technology.

Comments on facilities/equipment: the proposed equipment purchases under this grant will facilitate the acquisition of in-cylinder data and analysis of diesel engine operation using advanced measurement and computational tools. The equipment is required by and directly in support of the goals of improving diesel engine technology.

Concerns: there are two areas of concern. The first area is the collaboration with researchers from abroad, for example, from Japan. The Engine Research Center should establish mutually beneficial relationships, and should not become, unintentionally, a "tech exporter". The second area of concern is the lack of information about the continuation of efforts beyond year 1, in the event that funding for years 2 and 3 does not materialize. University based research efforts are optimal for multi-year execution, and the PI should indicate his contingency plans. Provided these concerns can be addressed, the proposal is recommended for funding. (This proposal was reviewed by the Army/Navy/Air Force Scientific Planning Group on Mechanics).

THE SECRETARY OF DEFENSE
WASHINGTON, THE DISTRICT OF COLUMBIA

December 30, 1992

MEMORANDUM FOR THE UNDER SECRETARY OF DEFENSE FOR ACQUISITION

SUBJECT: Results of Review of Certain Research-Related Projects

Based on the Director of Defense Research and Engineering's report of December 30, 1992, subject as above, and in accordance with the "Research, Development, Test and Evaluation, Defense Agencies" heading and Section 401 of the Department of Defense Appropriations Act, 1992 (Public Law 102-172), I direct as follows:

1. The Director of Defense Research and Engineering (DDR&E), in coordination with the Comptroller of the Department of Defense, shall take such action as may be necessary to make the full grants to George Mason University, University of Texas at Austin, and the University of Wisconsin, and the partial grant to Kansas State University, as identified in the DDR&E report.

2. The DDR&E shall review the proposals of Brandeis University, Louisiana State University, Northeastern University, and the University of Minnesota and advise the Secretary of Defense through the Deputy Secretary of Defense and the Under Secretary of Defense for Acquisition of his views on whether they meet the applicable statutory standards for the proposed grants.

3. The DDR&E shall notify the institutions whose proposals were reviewed in the DDR&E report, but for which this memorandum provides no grant or only a partial grant, that the funds provided in the "Research, Development, Test and Evaluation, Defense Agencies" heading of the Act remain available for obligation through September 30, 1993. The institutions may submit new proposals for the grants that, if they meet the applicable statutory standards, can be awarded prior to September 30, 1993. The DDR&E shall provide appropriate assistance to the institutions in formulating proposals that meet the applicable statutory standards.

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3010

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EXECUTIVE SUMMARY

MEMORANDUM FOR ~~THE SECRETARY OF DEFENSE~~

THROUGH: DEPUTY SECRETARY OF DEFENSE
UNDER SECRETARY OF DEFENSE (ACQUISITION) 22 MAR 1993

FROM: DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

SUBJECT: FY 1992 Grant Proposal from Kansas State University

PURPOSE: ACTION--Determine the amount of university award.

DISCUSSION:

- Public Law 102-172, as amended by Public Law 102-298, requires SecDef to review grants totalling $115.9 million, that were earmarked for 17 specific universities for "laboratory and other efforts associated with research, development and other programs of major importance to the Department of Defense," and award amounts "he deems appropriate based on the potential contribution each proposed project may make to the national scientific and technical posture." This law earmarked up to $7.7 M for Kansas State University (KSU).
- KSU submitted a proposal entitled "Equipment Support for Aeronautical Training," for the $7.7 M grant. This proposal, a technical abstract and additional technical information are at TAB A. The original proposal is summarized at TAB B.
- The results of the university evaluations were submitted to the SecDef and coordinated with the ASD(Legislative Affairs), OSD Comptroller, and the OSD General Counsel. Based on a technical evaluation of the proposal, funding of no more than $1.7M was recommended. This recommendation was based on an interpretation that the proposed effort had to focus on research and development that was of major importance to the Department of Defense. The SecDef concurred with this recommendation and approved partial funding of $1.7M for the proposal on December 30, 1992 (TAB C).
- KSU was notified of the partial award (TAB D) and encouraged to submit a new or revised proposal. TAB D also advised that DoD personnel would be available to assist in structuring a proposal that would satisfy the requirements.

- Continuing discussion of the Public Law 102-172 criteria resulted in a determination that the original interpretation had been too narrow. A grant to a university would meet the criteria of P.L. 102-172 if the proposal reflects an effort for: 1) laboratories; or 2) other efforts associated with research, development; or 3) other programs of major importance to the Department of Defense.

- KSU had discussions with DDR&E personnel and provided information to further amplify and explain the merits of the remaining elements of their proposal (TAB E).

- The balance of the KSU proposal is focused on the acquisition of aircraft and equipment, that, based on the additional information provided by KSU, would be used for the conduct of research on materials; screening of pilot candidates; training pilots and aircraft maintenance personnel; and related activities. Although the KSU proposal is not in the mainstream of the DoD Science and Technology program, the proposed efforts are considered to be either research or other issues that could be of major importance to DoD and the proposed projects could contribute to the national scientific and technical posture.

- Based on the expanded interpretation of the criteria and the amplifying data provided by KSU, it is concluded that the KSU proposal "Equipment Support for Aeronautical Training," could satisfy the criteria stated in Public Law, and could be reconsidered for award of the balance of the requested grant.

COORDINATIONS:

ASD(LA), OSD Comptroller, and OSD(GC) are at TAB F.

→ Debbie Lee would like to get this signed today (31 MAR) if possible
Exec Sec

RECOMMENDATION

That you consider approving additional funding for Kansas State University.

DR PERRY,
THE "BALANCE" IS $6.0M

DEF SECDEF DECISION

__________ Award Approved for $ 6.0 M for Kansas State University

__________ Disapproved

__________ Other: ______________________________

Prepared by: Art McGregor/DDDR&E(RLM)/x40205/19MAR93
Approved by: John M. Bachkosky/DDDR&E 3/20/93

April 21, 1993

Review of the Resubmitted Earmarked FY 1992 University Grant: CENTER FOR PHOTONICS RESEARCH, submitted by Boston University. (Reviewed by Drs. H. Pilloff (Chair), M. Marron, G. Wright, Office of Naval Research.)

1. Project summary: This proposal is for the release of $29,000,000 funding for the construction and establishment of a Center for Photonics Research at Boston University over a period of 3 years. This breaks down in the following way: $16,000,000 for construction (formally cost-shared with Boston Un. providing $5,000,000 real estate and $11,000,000 for a total of $32M for the value of the building and land), $3,471,935 for salaries + benefits, $4,764,748 for equipment, and the remainder in allowed costs for consumables, services, travel, consultants, meetings and conferences. A distinguished researcher will be recruited for the position of Project Director and a minimum of eight new faculty will be hired in the three year grant period to provide expertise in areas not sufficiently represented by current faculty.

2. Potential contribution to the national scientific and technical posture: It is expected that the proposed effort will make a significant contribution to the national scientific and technical posture. First, concerning the issue of relevance, Photonics is one of the Critical Technologies as listed in the May 1991 Defense Critical Technologies Plan and also maps into the July 1992 DoD Key Technologies Plan. The scale of the effort proposed here and the high quality of the staffing should ensure that there is sufficient "critical mass" to bring about genuine achievements, as opposed to subcritical dithering around. There is also a good plan to bring the work from basic research to prototype devices, to systems development, and finally to couple to local industry.

3. Quality of the actual proposed research funded by this grant: The quality of the proposed research is good. In the main, clear, leading edge topics at the forefront of research in these areas have been selected. It is noted that several of the research projects are strongly oriented toward technique development and not to the discovery of new principles which is viewed as a weakness of the proposal. While it is an important DoD objective to find improved methodologies for detecting chemical warfare agents, the ideas described in the Biomolecular Materials section for this application, which is only a small part of the overall proposal, are not credible and should be reconsidered or deleted.

4. Quality of the researchers doing any proposed research: Many of the individual investigators are internationally known. Some have been supported by ONR and other DoD agencies. The track records of the individual investigators allows one to predict that the research will lead to publications in premier journals

in the field.

5. Unique features of the proposal: The unique feature of this proposal is the coherent packaging of a good proposal for a large, special-topic university research program which is highly relevant to DoD objectives. This includes basic research through systems development and coupling to local industry together with a strong integrated commitment to preparing students for careers in this area.

6. Utilization and sustainability of the proposed project (facilities, equipment, personnel) after DoD funding is complete: In addition to the formal cost sharing identified in item 1. above, Boston University will provide partial faculty salaries and tuition remission for graduate students who will be fully supported by the program. After DoD funding is complete, subsequent support will be sought based on competitive submissions to federal and foundation sources and through corporate investment in research and development at the Photonics Center.

7. Geographic considerations that enhance desirability of the proposal: The Photonics Center will provide an important complement to the regional strength of Boston and New England in both military research and development and dual-use technology.

8. History of excellence of the institution in the technical area: Annualized extramural Physics funding in FY90 dollars totalled $4.75M in 1990, up from $0.68 in 1985 while Engineering funding grew in that period from $1M to $6M. At the same time funding per faculty member has increased approximately five-fold. Science and engineering departments have added over 30 new faculty in the past six years and PhD. enrollments have increased by over 100% to more than 250 students. Finally, recent junior faculty awards include 5 Sloan Fellows and 3 NSF Presidential Young Investigators.

H.S. Pilloff

H.S. Pilloff
Code 1112LO
Tel. (703) 696-4223

20 APR 1993

Review of Resubmitted Earmarked FY 1992 University Grant: CONSTRUCTION FUNDING OF THE NATIONAL CENTER FOR COMPLEX SYSTEMS, submitted by Brandeis University
(Reviewed by Drs. H. Hawkins (Chair), T. McMullen and T. McKenna, Office of Naval Research, Code 1142)

1. Project summary: The proposal is for the release of $2,000,000 funding towards the construction of a new facility on the Brandeis University campus: the National center for Complex Systems. The requested total would cover total project costs for approximately a two to three month time period during facility construction. Of the total cost, $1,944,470 are for construction, $11,320 are for Clerk of the Works, $32,750 are for A/E Fees, and $11,460 are for Administration/Personnel.

2. Potential contribution to the national scientific and technical posture: The proposed effort will make a significant contribution to the national scientific and technical posture. This contribution will be enabled by construction of the National Center for Complex Systems, which will enable cross-fertilization of ideas among researchers drawn from diverse academic departments (Computer Science, Biology, Biochemistry, Physics, and Psychology) to: (1) advance understanding of cognitive processes, perception, neuroscience, and parallel computation; (2) develop and apply parallel computer systems and methods for computational modeling of neurons, neural systems, and intelligent behavior; (3) transfer advances in the cognitive and neurosciences to improve design of computer hardware and software architecture in order to develop computational systems that are faster and better suited for building intelligent systems; (4) facilitate technology transfer of powerful and novel computational models and neuroscientific knowledge to a wide variety of complex systems and novel emerging technologies in the areas of computation and communications, biotechnology and medicine, education and training, and engineering; and (5) train a new generation of scientific researchers to lead advances in multidisciplinary sciences of the future.

3. Quality of actual proposed research funded by this grant. The grant does not fund research: it contributes toward construction of a facility for the conduct of research. The research to be conducted at the facility addresses leading edge issues in the disciplines represented at the Center.

4. Quality of the researchers doing any proposed research. The researchers that will comprise the Center's faculty are uniformly outstanding in their fields, and can be expected to contribute significantly to understanding of complex systems.

5. Relevance of proposed effort to DoD and the return on investment. The different branches of the DoD have traditionally supported many areas of research that currently take place within

the National Center for Complex systems. A strong return on investment can be anticipated, particularly in DoD-related areas of cognitive and neural sciences, computer science, and biological science.

6. The reasonableness of the proposed costs, excluding construction. The majority of the proposed costs are for construction. The remaining costs are reasonable.

7. Unique features of the proposal. The most unique features of the proposal are (1) the strong commitment of the University to the proposed Center, reflected by its commitment to provide approximately $14,000,000 in addition to that requested from the DoD for support of the planned construction, and (2) the uniformly high quality and productivity of the faculty that will form the backbone of the Center.

8. Benefit of duplication of proposed facilities if they are not unique. The proposed facilities are, for the most part, unique. Research and training space will be provided that is otherwise not available. In addition, the facility will enable collaborations and interactions that can be expected to contribute significantly to the quality and breadth of effort at the Center.

9. Utilization and sustainability of the proposed project (facilities, equipment, personnel) after DoD funding is complete. The University has committed to maintenance of the facility, once constructed, and to the continued support of the Center's faculty, staff and equipment.

10. Geographic considerations that enhance desirability of the proposal. The Center will be located in Waltham, Mass., placing it near other centers of excellance in the academic disciplines forming the Center's focus.

11. History of excellence of the institution in the technical area. Brandeis has a strong history of excellance in the fields contributing to the center. It's current faculty is outstanding in all areas, and has made significant contributions therein.

12. Other compelling rationale (e.g., educational, infrastructure, etc.) The study of complex systems increasingly is becoming interdisciplinary. The proposed facility will provide students the opportunity to develop the cross-disciplinary perspective and competence that will be required in this field.

Harold Hawkins

PROPOSAL EVALUATION
A Military Family Institute, Marywood College, Scranton, PA
(FY 1992 Earmarked Funds)

1. **Brief summary of what is proposed:** Marywood College proposes to establish a Military Family Institute that will provide the Department of Defense (DoD), interested academic communities, and private, nonprofit sector family research agencies with an organization that is fully dedicated to military family research. Research and other efforts such as a postdoctoral development program and an annual conference on military families form the essence of the proposal. No construction is proposed. Renovation of an existing building to be dedicated to the Institute's work is proposed. The total proposed cost is $10,994,404 over five years. This cost breakdown follows:

Institute Centralized Costs (Upgrade of computer/information systems)	$5,047,555
Research Projects	$5,618,519
Other Initiatives (Postdoctoral Fellowships, Annual Conference, etc.)	$ 328,330
TOTAL	$10,994,404

2. **Why it is believed that the proposal will or will not make a potential contribution to the national scientific and technical posture:** This proposal has the potential to make an important contribution to our basic understanding of military family issues and to the national scientific posture regarding family sociology. No scientific organization now exists dedicated to the military family. If established, this would be the single organization in the United States dedicated to and performing research on both normal and stressed military families.

3. **Assessment of the quality of the proposed research:** The quality of the research proposed is in keeping with the standards for research set by the American Psychological Association. Only two specific studies are proposed. Others studies are to be coordinated with DoD (FM&P) during development and prior to accomplishment.

4. Assessment of the quality of the researchers doing any proposed research: The Principal Investigators and the other scientists associated with the proposed Institute are published researchers with sufficient experience in conducting studies of the type proposed to assure that quality research will be conducted. Little military social science research experience is available among the current scientific staff. Additions to the research team may be required for specific aspects of the yet to be defined future studies on military families.

5. Relevance to the DoD and the return on investment: The proposal has significant relevance to issues of concern to the DoD and should provide significant information to guide family policy and program development. A reasonable return on investment can be expected.

6. Reasonableness of the proposed cost for the various elements of work: In general the costs seem to be in keeping with the proposed institute and its goals. However, the proposal seems to be excessive in the areas of management and equipment upgrades. For example, a program of this size should not require two Deputy Directors and equipment (mainly computer and office) expenditures of over $1.3M. As proposed, only 51% of the funding will be provided for actual research.

7. Unique features of the proposal: An institute devoted to military family research does not currently exist. In that sense the proposal itself is unique. Another unique aspect is the willingness of the proposed Military Family Institute to seek advice and guidance from the DoD as it develops and implements the research program.

8. Benefit of duplication of proposed facilities if they are not unique to the nation: The proposed Military Family Institute will be unique to the nation as an integrating research center on the military family.

9. Utilization and sustainability of the proposed project (facilities, equipment, personnel) after DoD funding is complete: There are no known sources of support for this kind of endeavor focused on the military family other than the DoD.

10. Any geographic considerations that enhance desirability of the proposal: None.

11. History of excellence of the institution in the technical area: A weakness of the proposal is that Marywood College has a limited history of working with military families from either an operational or a research perspective. Marywood College has a reasonable reputation for conducting social science studies and as a teaching institution.

12. Other compelling rationale (e.g., educational, infrastructure, etc...): None.

13. Other Issues: Before Marywood College could receive a grant or conduct any studies with humans, appropriate DHHS and/or DoD human use assurances will be required. No such assurances were provided with this proposal.

William O. Berry

William O. Berry
Director of Life and Environmental Sciences
Air Force Office of Scientific Research

EVALUATION OF PROPOSAL FROM MEDICAL COLLEGE OF OHIO FOR EARMARKED FY 1992 UNIVERSITY GRANT

(Reference: 30 Mar 1993 ODDR&E(R&LM) Memo)

The remarks provided below are based on the evaluations provided by the undersigned together with Air Force research specialists in toxicology and environmental chemistry as well as the review of potential legal aspects by AFOSR/JA.

Summary- The proposal titled "Establishment of a Center for Environmental Medicine at the Medical College of Ohio", submitted by the Medical College of Ohio (MCO) has been evaluated. In summary, the proposal provides a thorough description of the rationale and preliminary planning for the establishment of a Center for Environmental Medicine (CEM). The proposal also outlines follow-on plans for construction and related funding. The Center will have the capability to carry out interdisciplinary laboratory research studies of toxicological effects and associated mechanisms in humans for defense-related chemicals. Work tasks to be carried out under the proposal and associated costs include establishment of an organizational and administrative structure ($10,000); establishment of a scientific advisory board ($15,000); organization of research collaboration among MCO, Department of Defense, and external scientists ($20,000); preliminary facility design and construction planning ($120,000); establishment of a human tissue core facility ($20,000); establishment of a computerized chemical data base ($35,000); and recruitment of an epidemiologist to organize a statistical support system ($30,000). The total funding proposed for the one year effort is $250,000.

Basis for Potential Contribution to National Scientific and Technical Posture- The development of new, synthetic chemicals for defense materiel applications has taken place at a dramatically accelerated pace over the past fifty years. This pace has far outstripped the understanding of the potential hazards of these chemicals to the human body. This lagging pace can be attributed for many years to a failure to realize the necessity for intensive hazard assessment for all new chemicals. Although this attitude has changed, a major reason for the lagging pace today is the difficulty in understanding the complex nature of such hazards. This understanding can be promoted by an integrated interdisciplinary research effort of the type that the proposed Center would afford. In addition to the contribution to defense needs, the fundamental nature of the work proposed for the Center can be applied to private sector environmental hazards as well. The Center thus would possess the potential for a significant contribution to the national technical base for environmental hazards.

Quality of Proposed Research- MCO has provided a detailed description of the rationale for establishing a Center for Environmental Medicine and of the potential benefits from such a Center to the nation's defense as well as to the private sector. MCO has also provided a rational, integrated approach to preliminary planning for such a Center, incorporating all of the essential elements into their Task Outline, together with a descriptive timetable for implementing the plan in follow-on programs. The proposed integration and coordination of the effort with Air Force toxicology people, already begun and documented, is a critical part of this effort. The overall approach is generally reasonable but, so far, short on specifics.

Quality of Researchers Involved- The team assembled by MCO to carry out the proposed plan for establishing a Center for Environmental Medicine is capable of the intended tasks.. All of the major disciplines associated with environmental medicine are represented. The individuals representing the disciplines appear to have reasonable credentials with respect to background and experience.

Relevance to DOD- If properly organized to integrate cooperatively with DOD environmental research objectives, an institution such as CEM will undoubtedly be a good military investment. It will promote and help to insure a safe and hazard-free working environment for DOD personnel and surrounding populace. It will help to mitigate environmental compliance issues and aid in preventing unnecessary pollution. Contributions by the CEM would eventually translate into reduced costs as measured by savings in dollars, lives and environmental degradation.

Reasonableness of Costs- Overall costs seem appropriate. It would be recommended, however, to consider subsequently (during the grant negotiation phase if funding is approved) that the costs may be distributed differently among the seven planning objectives presented. The input and direction of a scientific advisory board (SAB) is not yet established.

Unique Features- The emphasis on mechanism-based studies in human tissues is a feature of the proposed Center which makes it unique versus other Centers for Environmental Medicine. The ability to further define and refine the nature of these studies, with the help of DOD input and that of a scientific advisory board is an important aspect.

Utilization of Proposed Project- The detailed plan for follow-on construction of the Center, together with the preliminary plan anticipated to be obtained from the proposed program will provide a better basis for a decision on the $17 million subsequent investment in the Center.

Geographic Considerations- The location of MCO, Toledo, Ohio, is a short distance from a major interactive Air Force toxicology center at Wright-Patterson Air Force Base, OH.

History of Institution- MCO has been in existence over twenty eight years, and has shown a good historical record in their proposal of facilities, capability for cutting-edge medical treatment such as organ transplantation, ability to attract funding, technology transfer, and training.

Special Considerations- The AFOSR Staff Judge Advocate has reviewed the MCO proposal and concluded that preparation of an Environmental Impact Statement (EIS) or Environmental Assessment (EA) would be required. The proposer has indicated a willingness to provide any data required by the Air Force to comply with the Air Force Environmental Impact Analysis Process However the time estimated for NEPA compliance is deemed overly optimistic. These issues would require early attention should the MCO proposal be approved for funding.

Donald L Ball
23Apr93

Donald L. Ball
AFOSR/NC

DEPARTMENT OF THE ARMY
ARMY RESEARCH OFFICE
P.O. BOX 12211
RESEARCH TRIANGLE PARK, NC 27709-2211

REPLY TO
ATTENTION OF

AMXRO-EL (340)

21 April 1993

MEMORANDUM FOR Acting Director, Research and Laboratory Management, Office of the Director of Defense Research and Engineering, Washington, DC 20301-3030

SUBJECT: Review of Resubmitted Earmarked FY 1992 University Grants (Monmouth College)

1. The subject proposal, submitted by Monmouth College, has been re-evaluated and acceptance is recommended. The Army Research Office has grant authority and is willing to award the grant. Because the proposed effort is completely focused upon Army C3I issues and because it augments the *Monmouth College - Fort Monmouth Five-Year Cooperative Research/Development Training Plan,* review was limited to Army Personnel. (Reviews are enclosed.)

2. Summary of Proposal: The proposed effort has three main thrusts. First is the development of a totally object-orientated methodology for the software engineering of C3I models and of a prototype software environment for testing and evaluating this methodology. The second key issue is the rapid development of high level models that can provide quantitative support for the concept and early design phase of system development. Finally, the methodology will result in models that can be used to support performance monitoring and resource management of fielded systems. Overall emphasis will be placed on software modularity and reusability, and the automation of the verification/valida-tion process. The total cost of the proposed investigation is $2.3 M over a four year period of performance. Of that total $1.7 M will be utilized to support the salaries and fringe benefits of technical staff, graduate students and clerical support. Total equipment purchase and renovation of laboratory space amounts to $0.21 M, utilized mainly for the purchase of computer equipment and software.

3. The resulting modeling/simulation techniques will be tested by application to complex, Army relevant problems of ATM (Asynchronous Transfer Mode) transport and BISDN (Broadband Integrated Services Digital Networks) to C3I systems. These problems are important not only for defense applications but for the commercial sector as well. They are well chosen, insuring technology transfer.

4. Proposed effort is at a high scientific level and very well planned. It is directly relevant to CECOM research needs. Accurate simulation and modeling of complex systems is rapidly developing into an area of primary concern to CECOM and state-of-the-art software is key to the solution to this problem.

Simulation and modeling techniques of large systems are of critical importance to the Army because of the need to have validated systems in spite of resource limitations, both financial and manpower.

5. The principal researchers of this effort are of the highest quality, with exceptional backgrounds to perform the proposed effort. The Principal Investigator was Head of the Performance Analysis Department at AT&T Bell Laboratories before joining the faculty of Monmouth College. The Senior Investigator was Chief Scientist and Head of the C3I architecture effort at the Center for Command, Control and Communications of CECOM before joining Monmouth College.

6. The proposed effort is highly relevant to ongoing programs at CECOM, Fort Monmouth, New Jersey. Results of this effort are directly applicable to a number of multi-service tactical communications systems under consideration by the Army at the present time. The effort will enhance and complement CECOM capabilities in the critical design, modeling and analysis areas of new C3I systems.

7. The proposed costs are commensurable with the proposed level of effort. There are no major construction projects associated with this effort.

8. Uniqueness of this effort lies in the areas of multi-faceted modeling and analysis of Army C3I systems and in the ability to validate emerging systems designs via simulation techniques.

9. It is proposed by Monmouth College to phase in support from other sources starting in the second year of the effort. Many communication oriented industries are located in the geographical area around Monmouth College. As a result many additional funding opportunities exist for an educational institution once they have established their expertise.

10. The close proximity of Monmouth College to CECOM, to AT&T Bell Laboratories, and to BELCORE Laboratories places this institution in an unique position to develop and transfer communications technology to the Army and industry.

AMXRO-EL (340)
SUBJECT: Review of Resubmitted Earmarked FY 1992 University Grants (Monmouth College)

11. Monmouth College has developed major curriculum directions in concert with Fort Monmouth. These curricula have been tailored to meet unique requirements of the Army in areas such as C3I and microwave engineering. As a result of the close working relationships that already exist between Monmouth College and Fort Monmouth, technology transfer will be expedited.

James W. Mink

James W. Mink
Director
Electronics Division

4 Encls
1. ARO Form 16
   14 April 1993
2. ARO Form 16
   14 April 1993
3. Evaluation - CECOM
4. Evaluation - CECOM

CF:
Dr. G. Iafrate
Dr. G. Neece

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY
3701 NORTH FAIRFAX DRIVE
ARLINGTON, VA 22203-1714

26 Apr 1993

MEMORANDUM FOR: ODDR&E

SUBJECT: Review of Resubmitted Earmarked FY1992 Proposal from Northeastern University

1. The revised proposal from Northeastern University was reviewed by staff from ARPA and the Services. It does meet the requirements stipulated by PL 102-172. The research topics which have proposed in the resubmitted proposal dated 25 March 1993 have the potential to contribute to the national science and technical posture.

2. The research project on fiber reinforced metal matrix composites (MMCs) has merit and deserves support. DoD has considerable interest in developing lower cost MMCs for a variety of applications. Northeastern's approach on the design and construction of a continuous MMC fabrication unit could contribute to a more effective manufacturing route for processing such materials. The proposed work on continuous process monitoring could be useful for eventually automating the manufacturing process. The emphasis on high temperature intermetallic MMCs could be beneficial to both the Navy's and Air Force's thrusts in this area.

3. The research project on plasma processing of materials has laudable goals. Both plasma ion implantation and anodic vacuum arc offer substantial advantages over contentional surface modification and coating methods. The proposed work has scientific merit and could provide new, environmentally safer, processing capabilities applicable to a manufacturing environment.

4. The research proposed in multiscale digital communications is very innovative and focuses on several critical issues in wireless communications. It addresses important research issues in the application of wavelets to this area, leading to a testbed for indoor wireless local area networks. The research supports dual use applications. The research addresses important issues for mobile wireless communications to enable rapidly deployable and reconfigurable local area networks. The research has the potential to advance capabilities in commercial applications of wireless communications, from wireless computing networks to centralized wireless monitoring of medical patients.

5. The research that would be undertaken by the graduate students added to existing DoD grants and contracts (using AASERT guidelines) will benefit DoD and contribute to the national science and technical posture.

6. Several reviewers feel that the request for construction is less well motivated than the proposed research. Given that research proposed is significant with potential to enhance the national science and technical posture, it seems reasonable to recommend that the entire $6M award from FY92 funds be made as proposed in the 25 March 1993 proposal from Northeastern University.

BAWilcox

Dr. Benjamin A. Wilcox
Defense Sciences Office

Review of Resubmitted Earmarked FY 1992 University Grant

The University of Minnesota: Research Laboratory Facilities Development

Reviewed by Eric Eisenstadt (Chair; ONR Code 1141MCEB), Harold Hawkins (ONR Code 1142) and CDR Robert Hawkins (ONR Code 223)

1. **Project Summary:** This is a request for $10 M to provide partial funding for the construction of a Basic Medical Sciences/Biomedical Engineering Building on the Minneapolis campus of the University of Minnesota. The State of Minnesota and the University of Minnesota have authorized $52.7 M towards construction of the building. The State and University authorizations may be contingent on the DOD award.

2. **Potential contribution to the national scientific and technical posture:** The biomedical research activities of the investigators outlined in this proposal are of very high quality. Collectively, this award will greatly enhance the ability of this group of investigators to make significant contributions to the national scientific and technical posture in the biomedical sciences. The University of Minnesota is a leading institution for the transfer of technology to the private sector. A new research facility at the University of Minnesota Medical School will facilitate multidisciplinary interactions among its faculty, thereby conributing to technology development via the enhancement of basic research capabilities.

3. **Quality of actual proposed research funded by this grant:** The grant would not fund research. Rather it will provide funds for construction of a new research facility.

4. **Quality of the researchers doing any proposed research:** The investigators at the University of Minnesota who will carry out research in the new facility are of high quality.

5. **Relevance of proposed effort to DOD and the return on investment:** The basic research activities to be carried out in the new facility are broadly related to DOD interests. Many of the specific activities outlined in this proposal are directly relevant to current areas of research supported by ONR, including vision research, neural control of locomotion and movement, and computational approaches to nerve function. The multidisciplinary research supported by this new facility will leverage other federally funded biomedical research and provide a good return on investment in DOD-related areas of research.

6. **The reasonableness of the proposed costs, excluding construction:** The funds will be used for construction of a new research facility.

7. **Unique features of the proposal:** A DOD award leverages a substantial contribution ($52.7 M) from State and University sources for the construction of an important new biomedical research facility. The multidisciplinary team of investigators will have some unique capabilities for working in areas such as computational neuroscience, sensory-motor integrative behavior, the study of single cell and simple nerve network organization, photoreceptor transduction, and visual cortical physiology and development.

8. **Benefit of duplication of proposed facilities if they are not unique:** Not applicable.

9. **Utilization and sustainability of the proposed project after DOD funding is complete:** The University of Minnesota is committed to the maintenance of the facility and will provide support for faculty, staff, and equipment.

10. **Any geographic considerations that enhance desireability of the proposal:** The facility will be located in the mid-West.

11. **History of excellence of the institution in the technical area:** The University of Minnesota has historically been one of the leading centers of research in the United States. For example, the cardiac pacemaker was developed at the University of Minnesota.

12. **Other compelling rationale:** Multidisciplinary research in the biological and medical sciences is essential for developing new scientific insights and technologies. The research facility proposed here will greatly facilitate multidisciplinary approaches to fundamentally important biological and biomedical problems.

Eric Eisenstadt

Eric Eisenstadt

OFFICE OF THE DIRECTOR OF
DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3030

17 MAY 1993

MEMORANDUM FOR DIRECTOR, DEFENSE RESEARCH AND ENGINEERING
THROUGH: DEPUTY DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

SUBJECT: Evaluation of Proposal from Texas Regional Institute of Environmental Studies (TRIES): Stewardship Attribute Assessment and Analysis

1. Overview. TRIES has been in existence since 1991, and consists of Sam Houston State University and Stephen F. Austin State University. The TRIES proposal focuses on one element of DoD's Strategic Environmental Plan: stewardship. In particular, the program offers to provide knowledge on the biology and ecology of endangered species at selected DoD properties. This knowledge will be used to assist DoD in resource management.

2. Budget Summary: Costs are summarized below. Detail is in the proposal and supplementary information provided by TRIES.

A.	Senior Personnel	$1.29M
B.	Other Personnel	.40M
C.	Fringe Benefits	.42M
D.	Permanent Equipment	1.37M
E.	Equipment Installation	.47M
F.	Travel	.13M
G.	Other Direct Costs	.85M
H.	Indirect Costs	.62M
I.	Total Direct & Indirect Costs	5.56M

The costs and their justification as contained in the proposal and supplemental information are reasonable, with the possible exception of the travel budget, which seems low. This may be rectified during the formal negotiation process leading to grant award. TRIES has provided a detailed breakout of equipment to be purchased (attached). A list of DoD sites has also been provided, however TRIES has offered to modify that list in a working relationship with DoD experts. TRIES has also offered to discuss the need for consultants with DoD experts. No construction funds are requested.

3. Summary of Proposed Work. TRIES proposes to accomplish the following major tasks:

A. Enumeration of environmental attributes of selected DoD properties. This includes field collection and monitoring, chemical analysis, identification of pollutants, and characterization of environment.

B. Creation and maintenance of comprehensive environmental databases for surveyed properties.

C. Development and utilization of object-oriented data base management tools.

D. Evaluation of new technologies for the characterization and analysis of environmental systems.

E. Development of quantifiable risk assessment tools for environmental systems.

F. Monitoring and mapping of anthropogenic features and site activities, especially with regards to endangered species.

G. Development of resource management strategies consistent with risk assessments.

4. Interactions with the TRIES. Drs. Lupo and Osterman of ODDDR&E have met with Dr. Michael Warnock, Principal Investigator (PI) for the project. Dr. Warnock is knowledgeable and serious about the proposed work. His verbal representations are consistent with the written proposal.

5. Overall assessment. The proposed work, if successful, should be of importance to DoD and the nation, since it will allow DoD to intelligently deal with the issue of endangered species on DoD properties. The techniques would clearly benefit the private sector as well. The disciplines and tools to be created should assist DoD in its other environmental imperatives. Although the project contains certain elements of moderate to high risk (e.g. ground truthing of data bases), the practical approach offered by Dr. Warnock and his staff should help to minimize risk.

6. Management. The project will receive frequent DoD oversight through a management team comprised of DoD experts, as led by Dr. Joe Osterman and Dr. Lupo. This management team will provide some guidance in site and consultant selection, and other matters as required. TRIES and Dr. Warnock are most cooperative, and have expressed a desire to adapt the project through this management process.

7. Recommendation. It is recommended that this proposal be approved at the appropriated amount of $5M for FY 1992.

J C Lupo

Jasper C. Lupo
Acting Director
Research and Laboratory Management

Attachment

Supplementary Information for Sam Houston State University Proposal for the Texas Regional Institute for Environmental Studies

1. Listing of potential initial sites and species to be studied.

From among the list of potential research sites shown on pages 12 and 13 of the proposal, the following are DoD properties which would be likely candidates for initial studies by the Texas Regional Institute for Environmental Studies. The citation of each property is accompanied by citation of one of more endangered or threatened species that might be found on the property. Neither the property listings nor the endangered species listings are meant to be exhaustive.

Camp Bullis	golden cheeked warbler
	black capped vireo
	ocelot
Eglin Air Force Base	red cockaded woodpecker
	bald eagle
	orchids
	pitcher plants
	Florida torrey pine
	least tern
Fort Bliss	puzzle sunflower
	Organ Mountain evening primrose
	Perityle cernua
	peregrine falcon
Fort Hood	golden cheeked warbler
	black capped vireo
	Alabama croton
Fort Huachuca	black capped gnatcatcher
	elegant trogon
	eared trogon
	ocelot
	jaguar
Fort Polk	red cockaded woodpecker
	Texas trailing phlox
Luke Air Force Range	Tumamoc globe berry
	desert bighorn sheep
	Acuna cactus

II. Mechanism for interactive selection of future study sites.

As stated in Section II, Part E, page 12 of the Texas Regional Institute for Environmental Studies (TRIES) proposal, the DoD sites listed were selected for their likelihood (due to size, location, and environmental conditions on adjoining properties) to contain endangered, threatened, or sensitive species; ease of access, ecological similarity to sites with which TRIES researchers have previous experience, schedule for realignment or closure, and proximity to TRIES. Some of the sites may not be appropriate for the proposed research because of restrictions due to safety or security considerations. Information on DoD priorities for stewardship research on these and other properties is not currently available to TRIES. Certainly DoD priorities will be a major factor in determining which sites are studied and in what order.

TRIES will work closely with DoD in establishing a prioritized list of DoD sites to be studied. In the interest of efficiency, each group (DoD and TRIES) should prepare preliminary lists of research sites based on the experience and expertise of each group. The DoD list would include those sites for which DoD has the most pressing need for research to be done (because of mandates affecting DoD activities, realignment or closure, or other factors). The TRIES list would include those sites most likely to harbor listed or candidate endangered and/or threatened species. A panel composed of representatives from DoD and TRIES would produce a summary priority list from the two preliminary lists. TRIES believes that it is extremely important for DoD and TRIES to work closely together, not only during the site selection process, but also in other aspects of the research effort to ensure that the resources of both entities are used efficiently and effectively.

III. Enumeration of equipment to be purchased under section D. on page 15.

Analytical Laboratory:		
GC/MS		$ 54,000.00
UV/visible spectrophotometer		28,000.00
FT IR spectrometer		190,000.00
Supercritical fluid extractor		42,000.00
GC Electron Capture Detector		28,000.00
HPLC		24,000.00
AA spectrometer		35,000.00
LC gradient system		49,000.00
Subtotal		$450,000.00
GIS Laboratory:		
Workstations	(7)	$256,000.00
Software		79,000.00
Data storage		150,000.00
Optical Disk		100,000.00
High Resolution Scanner		50,000.00
Large Format Scanner		20,000.00
Subtotal		$655,000.00
Field Equipment:		
Pickup truck to carry equip	(2)	$ 36,000.00
DGPS carrier phase receiver	(2)	24,000.00
Thermal Scanner	(1)	50,000.00
Airborne Video	(1)	40,000.00
Base station	(1)	55,000.00
Van to carry field personnel	(1)	21,000.00
Laptop computers	(10)	40,000.00
Subtotal		$266,000.00

IV. Elaboration on consultant services.

Consultant services listed in the budget for the original proposal (page 16) include estimates of amounts for data base management consultants to establish GIS database, software development for specialized applications, architectural services for laboratory remodeling, and environmental law services. These amounts are estimates based on discussions with prospective consultants and assessment of markets for similar services. The procedure for selecting and hiring consultants will follow established University and State of Texas guidelines. When possible, and with mutual agreement, TRIES would welcome the opportunity to identify and engage DoD personnel with expertise in these areas.

COORDINATION SHEET

SUBJECT: Grant Approval Decision for Part of the Resubmitted FY 1992 University Earmarks

OFFICE/DEPARTMENT/AGENCY	CONCUR	DATE
ASD(LA)	Larry G. Shockley	18 MAY 93
OSD(COMPTROLLER)		
OSD(GENERAL COUNSEL)		

REMARKS:

COORDINATION SHEET

SUBJECT: Grant Approval Decision for Part of the Resubmitted FY 1992 University Earmarks

OFFICE/DEPARTMENT/AGENCY	CONCUR	DATE
ASD(LA)		
OSD(COMPTROLLER)		5/17/93
OSD(GENERAL COUNSEL)		

REMARKS:

COORDINATION SHEET

SUBJECT: Grant Approval Decision for Part of the Resubmitted FY 1992 University Earmarks

OFFICE/DEPARTMENT/AGENCY	CONCUR	DATE
ASD(LA)		
OSD(COMPTROLLER)		
OSD(GENERAL COUNSEL)	John H McNeill, acting	5/18/93

REMARKS:

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3010

COORDINATION SHEET

MEMORANDUM FOR THE SECRETARY OF DEFENSE

THROUGH: DEPUTY SECRETARY OF DEFENSE
UNDER SECRETARY OF DEFENSE (ACQUISITION)

FROM: DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

SUBJECT: Grant Approval for the FY 1992 Texas Regional Texas Regional Institute for Environmental Studies' (TRIES) Proposal

PURPOSE: ACTION--Coordinate on the recommendation to the SecDef for approval of the FY 1992 TRIES grant.

DISCUSSION:

- The evaluation of the revised FY 1992 proposal for the Texas Regional Institute for Environmental Studies (TRIES) at Sam Houston State University & Stephen F. Austin State University is attached at TAB A.

- Technical evaluation for the revised proposal recommends full funding, at the appropriated amount, to the TRIES. This recommendation is based on the assessment that the proposed project meets the statutory requirements to have the potential to make a contribution to the national scientific and technical posture.

- Due to the shortness of time, the evaluation on the TRIES proposal has been included into the SecDef Decision Package, subject "Grant Approval Decision for Part of the Resubmitted FY 1992 University Earmarks" prior to coordination. If you nonconcur on the TRIES recommendation, please call this office immediately.

COORDINATIONS:

→ ASD(LA): Larry G. Shockley Date: 18 May 93
DoD Comptroller: ______________________ Date: __________
OSD(GC): ______________________ Date: __________

RECOMMENDATION: Recommend that you approve the grant award to the Texas Regional Institute for Environmental Studies (Sam Houston State University & Stephen F. Austin State University).

Prepared by: A. McGregor/ODDR&E(RLM)/x40205/5-17-93 A.P.C.
Approved by: John M. Bachkosky/DDDR&E/x50598/5-17-93 Bachkosky 5/17/93

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3010

COORDINATION SHEET

MEMORANDUM FOR THE SECRETARY OF DEFENSE

THROUGH: DEPUTY SECRETARY OF DEFENSE
UNDER SECRETARY OF DEFENSE (ACQUISITION)

FROM: DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

SUBJECT: Grant Approval for the FY 1992 Texas Regional Texas Regional Institute for Environmental Studies' (TRIES) Proposal

PURPOSE: ACTION--Coordinate on the recommendation to the SecDef for approval of the FY 1992 TRIES grant.

DISCUSSION:

- The evaluation of the revised FY 1992 proposal for the Texas Regional Institute for Environmental Studies (TRIES) at Sam Houston State University & Stephen F. Austin State University is attached at TAB A.
- Technical evaluation for the revised proposal recommends full funding, at the appropriated amount, to the TRIES. This recommendation is based on the assessment that the proposed project meets the statutory requirements to have the potential to make a contribution to the national scientific and technical posture.
- Due to the shortness of time, the evaluation on the TRIES proposal has been included into the SecDef Decision Package, subject "Grant Approval Decision for Part of the Resubmitted FY 1992 University Earmarks" prior to coordination. If you nonconcur on the TRIES recommendation, please call this office immediately.

COORDINATIONS:

ASD(LA): ____________________ Date: __________

→ DoD Comptroller: ____________________ Date: 5/17/93

OSD(GC): ____________________ Date: __________

RECOMMENDATION: Recommend that you approve the grant award to the Texas Regional Institute for Environmental Studies (Sam Houston State University & Stephen F. Austin State University).

Prepared by: A. McGregor/ODDR&E(RLM)/x40205/5-17-93 A.P.
Approved by: John M. Bachkosky/DDDR&E/x50598/5-17-93 5/17/93

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3010

COORDINATION SHEET

MEMORANDUM FOR THE SECRETARY OF DEFENSE

THROUGH: DEPUTY SECRETARY OF DEFENSE
UNDER SECRETARY OF DEFENSE (ACQUISITION)

FROM: DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

SUBJECT: Grant Approval for the FY 1992 Texas Regional Texas Regional Institute for Environmental Studies' (TRIES) Proposal

PURPOSE: ACTION--Coordinate on the recommendation to the SecDef for approval of the FY 1992 TRIES grant.

DISCUSSION:

- The evaluation of the revised FY 1992 proposal for the Texas Regional Institute for Environmental Studies (TRIES) at Sam Houston State University & Stephen F. Austin State University is attached at TAB A.
- Technical evaluation for the revised proposal recommends full funding, at the appropriated amount, to the TRIES. This recommendation is based on the assessment that the proposed project meets the statutory requirements to have the potential to make a contribution to the national scientific and technical posture.
- Due to the shortness of time, the evaluation on the TRIES proposal has been included into the SecDef Decision Package, subject "Grant Approval Decision for Part of the Resubmitted FY 1992 University Earmarks" prior to coordination. If you nonconcur on the TRIES recommendation, please call this office immediately.

COORDINATIONS:

ASD(LA): ______________________ Date: __________

DoD Comptroller: ______________________ Date: __________

→ OSD(GC): John H McNeill, acting Date: 5/18/93

RECOMMENDATION: Recommend that you approve the grant award to the Texas Regional Institute for Environmental Studies (Sam Houston State University & Stephen F. Austin State University).

Prepared by: A. McGregor/ODDR&E(RLM)/x40205/5-17-93 A.P.
Approved by: John M. Bachkosky/DDDR&E/x50598/5-17-93 5/17/93

OFFICE OF THE DIRECTOR OF
DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3030

17 MAY 1993

MEMORANDUM FOR DIRECTOR, DEFENSE RESEARCH AND ENGINEERING
THROUGH: DEPUTY DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

SUBJECT: Evaluation of Proposal from Texas Regional Institute of Environmental Studies (TRIES): Stewardship Attribute Assessment and Analysis

1. Overview. TRIES has been in existence since 1991, and consists of Sam Houston State University and Stephen F. Austin State University. The TRIES proposal focuses on one element of DoD's Strategic Environmental Plan: stewardship. In particular, the program offers to provide knowledge on the biology and ecology of endangered species at selected DoD properties. This knowledge will be used to assist DoD in resource management.

2. Budget Summary: Costs are summarized below. Detail is in the proposal and supplementary information provided by TRIES.

A.	Senior Personnel	$1.29M
B.	Other Personnel	.40M
C.	Fringe Benefits	.42M
D.	Permanent Equipment	1.37M
E.	Equipment Installation	.47M
F.	Travel	.13M
G.	Other Direct Costs	.85M
H.	Indirect Costs	.62M
I.	Total Direct & Indirect Costs	5.56M

The costs and their justification as contained in the proposal and supplemental information are reasonable, with the possible exception of the travel budget, which seems low. This may be rectified during the formal negotiation process leading to grant award. TRIES has provided a detailed breakout of equipment to be purchased (attached). A list of DoD sites has also been provided, however TRIES has offered to modify that list in a working relationship with DoD experts. TRIES has also offered to discuss the need for consultants with DoD experts. No construction funds are requested.

3. Summary of Proposed Work. TRIES proposes to accomplish the following major tasks:

A. Enumeration of environmental attributes of selected DoD properties. This includes field collection and monitoring, chemical analysis, identification of pollutants, and characterization of environment.

B. Creation and maintenance of comprehensive environmental databases for surveyed properties.

C. Development and utilization of object-oriented data base management tools.

D. Evaluation of new technologies for the characterization and analysis of environmental systems.

E. Development of quantifiable risk assessment tools for environmental systems.

F. Monitoring and mapping of anthropogenic features and site activities, especially with regards to endangered species.

G. Development of resource management strategies consistent with risk assessments.

4. Interactions with the TRIES. Drs. Lupo and Osterman of ODDDR&E have met with Dr. Michael Warnock, Principal Investigator (PI) for the project. Dr. Warnock is knowledgeable and serious about the proposed work. His verbal representations are consistent with the written proposal.

5. Overall assessment. The proposed work, if successful, should be of importance to DoD and the nation, since it will allow DoD to intelligently deal with the issue of endangered species on DoD properties. The techniques would clearly benefit the private sector as well. The disciplines and tools to be created should assist DoD in its other environmental imperatives. Although the project contains certain elements of moderate to high risk (e.g. ground truthing of data bases), the practical approach offered by Dr. Warnock and his staff should help to minimize risk.

6. Management. The project will receive frequent DoD oversight through a management team comprised of DoD experts, as led by Dr. Joe Osterman and Dr. Lupo. This management team will provide some guidance in site and consultant selection, and other matters as required. TRIES and Dr. Warnock are most cooperative, and have expressed a desire to adapt the project through this management process.

7. Recommendation. It is recommended that this proposal be approved at the appropriated amount of $5M for FY 1992.

Jasper C. Lupo
Acting Director
Research and Laboratory Management

Attachment

Supplementary Information for Sam Houston State University Proposal for the Texas Regional Institute for Environmental Studies

1. Listing of potential initial sites and species to be studied.

From among the list of potential research sites shown on pages 12 and 13 of the proposal, the following are DoD properties which would be likely candidates for initial studies by the Texas Regional Institute for Environmental Studies. The citation of each property is accompanied by citation of one of more endangered or threatened species that might be found on the property. Neither the property listings nor the endangered species listings are meant to be exhaustive.

Camp Bullis	golden cheeked warbler
	black capped vireo
	ocelot
Eglin Air Force Base	red cockaded woodpecker
	bald eagle
	orchids
	pitcher plants
	Florida torrey pine
	least tern
Fort Bliss	puzzle sunflower
	Organ Mountain evening primrose
	Perityle cernua
	peregrine falcon
Fort Hood	golden cheeked warbler
	black capped vireo
	Alabama croton
Fort Huachuca	black capped gnatcatcher
	elegant trogon
	eared trogon
	ocelot
	jaguar
Fort Polk	red cockaded woodpecker
	Texas trailing phlox
Luke Air Force Range	Tumamoc globe berry
	desert bighorn sheep
	Acuna cactus

II. Mechanism for interactive selection of future study sites.

As stated in Section II, Part E, page 12 of the Texas Regional Institute for Environmental Studies (TRIES) proposal, the DoD sites listed were selected for their likelihood (due to size, location, and environmental conditions on adjoining properties) to contain endangered, threatened, or sensitive species; ease of access, ecological similarity to sites with which TRIES researchers have previous experience, schedule for realignment or closure, and proximity to TRIES. Some of the sites may not be appropriate for the proposed research because of restrictions due to safety or security considerations. Information on DoD priorities for stewardship research on these and other properties is not currently available to TRIES. Certainly DoD priorities will be a major factor in determining which sites are studied and in what order.

TRIES will work closely with DoD in establishing a prioritized list of DoD sites to be studied. In the interest of efficiency, each group (DoD and TRIES) should prepare preliminary lists of research sites based on the experience and expertise of each group. The DoD list would include those sites for which DoD has the most pressing need for research to be done (because of mandates affecting DoD activities, realignment or closure, or other factors). The TRIES list would include those sites most likely to harbor listed or candidate endangered and/or threatened species. A panel composed of representatives from DoD and TRIES would produce a summary priority list from the two preliminary lists. TRIES believes that it is extremely important for DoD and TRIES to work closely together, not only during the site selection process, but also in other aspects of the research effort to ensure that the resources of both entities are used efficiently and effectively.

III. Enumeration of equipment to be purchased under section D. on page 15.

Analytical Laboratory:

GC/MS	$ 54,000.00
UV/visible spectrophotometer	28,000.00
FT IR spectrometer	190,000.00
Supercritical fluid extractor	42,000.00
GC Electron Capture Detector	28,000.00
HPLC	24,000.00
AA spectrometer	35,000.00
LC gradient system	49,000.00
Subtotal	$450,000.00

GIS Laboratory:

Workstations	(7)	$256,000.00
Software		79,000.00
Data storage		150,000.00
Optical Disk		100,000.00
High Resolution Scanner		50,000.00
Large Format Scanner		20,000.00
Subtotal		$655,000.00

Field Equipment:

Pickup truck to carry equip	(2)	$ 36,000.00
DGPS carrier phase receiver	(2)	24,000.00
Thermal Scanner	(1)	50,000.00
Airborne Video	(1)	40,000.00
Base station	(1)	55,000.00
Van to carry field personnel	(1)	21,000.00
Laptop computers	(10)	40,000.00
Subtotal		$266,000.00

IV. Elaboration on consultant services.

Consultant services listed in the budget for the original proposal (page 16) include estimates of amounts for data base management consultants to establish GIS database, software development for specialized applications, architectural services for laboratory remodeling, and environmental law services. These amounts are estimates based on discussions with prospective consultants and assessment of markets for similar services. The procedure for selecting and hiring consultants will follow established University and State of Texas guidelines. When possible, and with mutual agreement, TRIES would welcome the opportunity to identify and engage DoD personnel with expertise in these areas.

OFFICE OF THE DIRECTOR OF
DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3030

30 MAR 1993

MEMORANDUM FOR DIRECTOR, ARMY RESEARCH OFFICE
DIRECTOR, OFFICE OF NAVAL RESEARCH
DIRECTOR, AIR FORCE OFFICE OF SCIENTIFIC RESEARCH
DIRECTOR, ARPA (ATTN: Dr. Wilcox)
DIRECTOR, DNA (ATTN: Mr. Gerding)
DIRECTOR, ARMY MEDICAL RESEARCH & DEVELOPMENT COMMAND (ATTN:Col C.F.Tyner)
DIRECTOR, ENGINEER WATERWAYS EXPERIMENTAL STATION (ATTN:Dr. J. Keely)

SUBJECT: Review of Resubmitted Earmarked FY 1992 University Grants

The attached "revised proposals" for the earmarked FY 1992 grants are forwarded to your office for evaluation. You are responsible for the entire evaluation including: selection of the evaluation team reviewers (any appropriate Government personnel with expertise in the proposal technical area), the evaluation, and the evaluation write-up.

Your correspondence accompanying the evaluation should identify the grant awarding office. Please note that the office must have grant authority to award the grant. A written signed evaluation must be submitted to ODDR&E by April 26, 1993, and should be written so it is releasable to the public. Proposal evaluations should be based on technical merit, and at a minimum describe the following:

- Top level summary of what is proposed (include total cost, amounts of construction, equipment, salaries of personnel, and other major expenditures)

- Why it is believed that the proposal will or will not make a potential contribution to the national scientific and technical posture.

- The quality of actual proposed research funded by this grant.

- The quality of the researchers doing any proposed research.

- Relevance of proposed effort to DoD and the return on investment.

- The reasonableness of the proposed cost for various major elements of work, excluding construction costs unless known.

- Unique features of the proposal.

- Benefit of duplication of proposed facilities if they are not unique.

- Utilization and sustainability of the proposed project (facilities, equipment, personnel) after DoD funding is complete.
- Any geographic considerations that enhance desirability of the proposal.
- History of excellence of the institution in the technical area.
- Other compelling rationale (e.g., educational, infrastructure, etc.).

The statutory language for the grants is also attached for your convenience as well as the Tasking Chart. If you have any questions or comments please call me or Mr. McGregor at (703) 614-0205.

Jasper C. Lupo
Acting Director
Research and Laboratory Management

Attachments

STATUTORY LANGUAGE FOR FY 1992 UNIVERSITY GRANTS

PUBLIC LAW 102-172, TITLE IV (RDT&E) TYPICAL

Provided further, That not less than $XX,XXX,XXX of the funds appropriated in this paragraph shall be made available as a grant only to the XXXXXXXXXX XXXXXXXXXX (College or University) for laboratory and other efforts associated with research, development and other programs of major importance to the Department of Defense:

PUBLIC LAW 102-172, SECTION 401
AS AMENDED BY PL 102-298, SECTION 302

Provided, That the Secretary of Defense shall review grants totalling $115,900,000 and specified previously in this title and shall award such amounts as he deems appropriate based on the potential contribution each proposed project may make to the national scientific and technical posture:

INSTITUTION	SCIENTIFIC PLANNING GROUP	RESPONSIBLE ORGANIZATION & POC
Boston University	Physics	ONR:Dr. Herschel Pilloff 703-696-4223
Brandeis University **	Cognitive & Neural Sci	ONR:Dr. Harold Hawkins 703-696-4323
George Mason University *	Mathematical Sci	ONR:Dr. Neil Gerr 703-696-4321
Kansas State Univ *	Mechanics	ODDR&E(assist):Dr. Dix 703-695-0005 AFOSR(award):Dr. Chang 202-767-4987
LSU--Neuroscience Ctr **	Biological & Medical	ARMY Medical Cmd ($): Col. Fred Tyner 301-619-7377 Col. Andres Salazar (Walt. Reed)202-576-1345
Marywood College	Cognitive & Neural Sci	FM&P:LTC John Nelson 703-697-7191 (AFOSR $):Dr. Berry 202-767-4278
Medical College of Ohio	Environmental Quality	AFOSR:Dr. Ball 202-767-4960
Monmouth College	Cognitive & Neural Sci	ARO:Dr. James Mink 919-549-4240
Nat'l Biomedical Research Found'n	Biological & Medical	DARPA:Dr. Frank Patten 703-696-2285 Dr. Ira Skurnich 703-696-2286
New Mexico State University	Joint OXRs	ARO:Dr. Andrew Crowson 919-549-4261
Northeastern University **	Materials Sci	DARPA ($):Dr. Ben Wilcox 703-696-2241
Texas Reg'l Inst for Environ Studies	Environmental Quality	Army Corps of Engrs:Dr. Oswald 202-272-1839 Dr. John Keely 601-634-3477
University of Minnesota **	Biological & Medical	ONR:Dr. Eric Eisenstadt 703-696-4596
University of St. Thomas, Minnesota	Computer Sci	DNA:Mr. James Gerding 703-325-1217
University of South Carolina	Environmental Quality	Army Corps of Engrs:Dr. Oswald 202-272-1839 Dr. John Keely 601-634-3477
Univ of Texas, Austin *	Electronics (Army Materials)	DARPA:Dr. Ben Wilcox 703-696-2241
University of Wisconsin *	Mechanics	ARO:Dr. David Mann 919-549-4249
Bradley University ***	Not Applicable	DNA:Mr. James Gerding 703-325-1217

* These grants were fully or partially approved by the Sec Def on December 30, 1992.

** These University proposals have not had a funding decision made by the SecDef.

*** This grant was approved by the Sec Def on January 15, 1993.

THE ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, DC 20301-1300

LEGISLATIVE AFFAIRS

April 8, 1993

MEMORANDUM FOR THE SECRETARY OF DEFENSE

FROM: **Debbie Lee, John Deutch, Alice Maroni and Rudy de Leon**

SUBJECT: **Recommended Disposition for FY92 and FY93 Grants Earmarked for Universities**

We have met to discuss the preferable disposition of the university grants earmarked in the FY92 and FY93 Appropriations bills.

- o It turns out that you have the legal authority and flexibility to grant any or all of the $104.6 million in grants awarded in FY92, see Tab A;
- o You must eventually award $104 million of the $179 million total grants earmarked in FY93, see Tab B;
- o The remaining $75 million provided in FY93 may be granted and a review panel may be employed to aid selection among this group, see Tab C.

We present to you three alternative courses of action. We believe the decision you make:

1) will influence external impressions of how DOD will respond to future earmarks (in contrast to R&D awards based on merit), and

2) will impact on your relationship with key Members of Congress.

Alternative #1 Eventually grant all proposals in FY92 and 93, (i.e. all grants listed in Tabs A-C). While the law allows you to withhold funds for a number of these projects, you have considerable flexibility.

Pros:

- o This approach is the easiest course and the interested parties will be very pleased.

Cons:

- o It might be viewed as a sign that DOD will acquiesce to future Congressional earmarks. This might be avoided if the award announcement is accompanied by a firm policy statement.
- o Full release of the funds might put us in a difficult financial position -- some of the earmarks could be used, down the line, to pay for other items, like Somalia.

John Deutch, Debbie Lee and Rudy de Leon support this approach as a second choice.

Alternative #2 Grant only those proposals required by law, (i.e. award all grants listed in Tab B and deny grants listed in Tabs A and C). Your rationale for denying all discretionary grants would be that in these times of stringent budgets, these grants are not "appropriate based on the potential contribution each proposed project may make to the national scientific and technical posture". (The quote comes straight out of the law.) A variant of this approach would be to run a peer review for the discretionary FY93 projects and award those grants that meet the criterion of a reasonable contribution to the scientific and technical posture.

Pros:

- o This would signal a strong stand against earmarking.
- o Sam Nunn and other like-minded Members would like this approach.

Cons:

- o It would definitely garner Congressional anger from the interested parties.
- o It would also make Congress aware of the way to write future earmarks to offer no future flexibility. From this point forward. Congress would likely write earmarks as they did in the case of those at Tab B.

John Deutch and Alice Maroni support this approach as a first choice.

Alternative #3 Grant a selected number of projects from the FY92 and FY93 lists that meet the requirement of significant Congressional interest. DoD would actively work with the authors of these proposals to ensure that the dollars are spent wisely.

Pros:

- o This is a fiscal middle ground, which would also allow you to have a good relationship with Congress.

Cons:

- o This approach may be viewed as unfair.

Debbie Lee and Rudy de Leon support this approach as a first choice. Alice supports this as a second choice. John Deutch does not support this approach at all.

SECDEF DECISION:

Alternative #1 ____________

Alternative #2 ____________

Alternative #3 ____________

Let's discuss ____________

Attachments: Tabs A-C

④

FY 1992 APPROPRIATIONS UNIVERSITY EARMARKS

INSTITUTION	APPROPRIATED	TECH AREA	RESPONSIBLE ORGANIZATION
Boston University	$29.00 M	Est. Photonics Ctr/ Bldg/Equip.	ONR
Brandeis University	$ 2.00 M	Building	ONR
George Mason University * done	$ 0.75 M	Parallel Cptr/Research	ONR
Kansas State Univ ** done	$ 7.70 M	Aeronautical Equipment	AFOSR/ODDR&E
Louisiana State Univ -- Neuroscience Ctr	$10.00 M	Building, Equipment	Army Med R&D Cmd
Marywood College	$10.00 M	Est. Mil. Family Inst./Research	AFOSR/FM&P
Medical College of Ohio	$ 0.25 M	Building Plans	AFOSR
Monmouth College	$ 2.30 M	M&S Ctr/Dev Courses/Cptrs	ARO
Nat'l Biomedical Research Found'n (Georgetown U)	$10.00 M	Building	DARPA
New Mexico State University	$ 3.00 M	Est. Adv Manufacturing Dept.	ARO
Northeastern University	$ 6.00 M	Building	DARPA
Texas Reg'l Inst. Envir. Studies (Sam Houston State Univ. & Stephen F. Austin State U.)	$ 5.00 M	Est. Rural Envir. Dept.	Army Corps Engrs
University of Minnesota	$10.00 M	Building	ONR
University of St. Thomas, MN	$ 0.50 M	Building Plans	DNA
University of South Carolina	$ 0.50 M	Est. Envir. Dept.	Army Corps Engrs
Univ of Texas, Austin * done	$ 6.00 M	I.C. Equipment (SEMATEC)	DARPA
University of Wisconsin * done	$ 1.60 M	Deisel Eng. Research	ARO
	$104.60 M		

* SECDEF approved full funding for these Universities on December 30, 1992

FY 1993 APPROPRIATIONS UNIVERSITY EARMARKS
Not Specifically Subject to SecDef Award Decision

	FY 93	FY 92
National Center for Acoustics --(Miss. Resource Dev. Corp. (U. of Miss.))	$ 1.00M	$ 1.00M
West Virginia High Technology Corporation	$ 1.50	
* Bradley University, Illinois	$ 7.50	
Bryant College of Rhode Island	$ 2.00	
Colorado State University	$ 5.00	
Illinois Institute of Technology	$ 5.00	
Loma Linda University	$ 5.00	
Louisiana State University	$ 4.00	$ 10.00
Medical College of Ohio	$ 1.00	$ .25
National Biomedical Research Foundation (Georgetown University)	$ 10.00	$ 10.00
Northeastern University	$ 9.00	$ 6.00
Rochester Institute of Technology	$ 3.00	
Science Center of Connecticut	$ 3.00	
Spokane Intercollegiate Research & Tech Inst	$ 15.00	
Texas Regional Inst for Environmental Studies (Sam Houston State Univ. & Steven F. Austin State University)	$ 5.00	$ 5.00
University of Maryland	$ 7.50	
University of Miami, Florida	$ 2.00	
University of Michigan	$ .50	
University of Minnesota	$ 2.00	$ 10.00
University of Pennsylvania	$ 7.50	
University of Scranton	$ 3.50	
University of South Florida	$ 2.00	
Villanova University	$ 2.00	
SUBTOTAL	$104.00 M	$ 42.25 M

* SecDef Approved and Directed Full Award on January 15, 1993

Discretionary

FY 1993 APPROPRIATIONS UNIVERSITY EARMARKS (continued)
Subject to SecDef Review and Award Decision

	FY 93	FY 92
John Carroll University	$ 5.30 M	
John Hopkins University	$ 15.00	
Medical College of Wisconsin	$ 15.00	
St. Norbert College	$ 3.90	
University of Arizona	$ 5.00	
University of Northern Iowa	$ .75	
University of St Thomas, St Paul, Minnesota	$ 15.00	$ .50 M
University of Wisconsin (Center for Advanced Propulsion)	$ 15.00	1.60
SUBTOTAL	$ 74.95 M	$ 2.10 M
GRANDTOTAL	$178.95 M	$ 44.35 M

NOTE: - ALL OF THESE UNIVERSITY GRANTS, EXCEPT THE NATIONAL CENTER FOR ACOUSTICS, THE WEST VIRGINIA HIGH TECHNOLOGY CORPORATION, AND BRADLEY UNIVERSITY, WERE INCLUDED IN THE $560M TRANSFER REQUEST SENT TO CONGRESS ON JANUARY 15, 1993, BY PRESIDENT BUSH TO PAY FOR COSTS ASSOCIATED WITH OPERATION RESTORE HOPE.

- THE DOD(C) HAS SINCE ADVISED ODDR&E THAT OTHER FUNDS WILL BE TRANSFERRED TO FINANCE OPERATION RESTORE HOPE. THE MONEY LISTED IN THE TRANSFER REQUEST IS AVAILABLE FOR RELEASE PENDING A PLAN FOR EXPENDITURE.

April 21, 1993

Review of the Resubmitted Earmarked FY 1992 University Grant: CENTER FOR PHOTONICS RESEARCH, submitted by Boston University. (Reviewed by Drs. H. Pilloff (Chair), M. Marron, G. Wright, Office of Naval Research.)

1. Project summary: This proposal is for the release of $29,000,000 funding for the construction and establishment of a Center for Photonics Research at Boston University over a period of 3 years. This breaks down in the following way: $16,000,000 for construction (formally cost-shared with Boston Un. providing $5,000,000 real estate and $11,000,000 for a total of $32M for the value of the building and land), $3,471,935 for salaries + benefits, $4,764,748 for equipment, and the remainder in allowed costs for consumables, services, travel, consultants, meetings and conferences. A distinguished researcher will be recruited for the position of Project Director and a minimum of eight new faculty will be hired in the three year grant period to provide expertise in areas not sufficiently represented by current faculty.

2. Potential contribution to the national scientific and technical posture: It is expected that the proposed effort will make a significant contribution to the national scientific and technical posture. First, concerning the issue of relevance, Photonics is one of the Critical Technologies as listed in the May 1991 Defense Critical Technologies Plan and also maps into the July 1992 DoD Key Technologies Plan. The scale of the effort proposed here and the high quality of the staffing should ensure that there is sufficient "critical mass" to bring about genuine achievements, as opposed to subcritical dithering around. There is also a good plan to bring the work from basic research to prototype devices, to systems development, and finally to couple to local industry.

3. Quality of the actual proposed research funded by this grant: The quality of the proposed research is good. In the main, clear, leading edge topics at the forefront of research in these areas have been selected. It is noted that several of the research projects are strongly oriented toward technique development and not to the discovery of new principles which is viewed as a weakness of the proposal. While it is an important DoD objective to find improved methodologies for detecting chemical warfare agents, the ideas described in the Biomolecular Materials section for this application, which is only a small part of the overall proposal, are not credible and should be reconsidered or deleted.

4. Quality of the researchers doing any proposed research: Many of the individual investigators are internationally known. Some have been supported by ONR and other DoD agencies. The track records of the individual investigators allows one to predict that the research will lead to publications in premier journals

in the field.

5. Unique features of the proposal: The unique feature of this proposal is the coherent packaging of a good proposal for a large, special-topic university research program which is highly relevant to DoD objectives. This includes basic research through systems development and coupling to local industry together with a strong integrated commitment to preparing students for careers in this area.

6. Utilization and sustainability of the proposed project (facilities, equipment, personnel) after DoD funding is complete: In addition to the formal cost sharing identified in item 1. above, Boston University will provide partial faculty salaries and tuition remission for graduate students who will be fully supported by the program. After DoD funding is complete, subsequent support will be sought based on competitive submissions to federal and foundation sources and through corporate investment in research and development at the Photonics Center.

7. Geographic considerations that enhance desirability of the proposal: The Photonics Center will provide an important complement to the regional strength of Boston and New England in both military research and development and dual-use technology.

8. History of excellence of the institution in the technical area: Annualized extramural Physics funding in FY90 dollars totalled $4.75M in 1990, up from $0.68 in 1985 while Engineering funding grew in that period from $1M to $6M. At the same time funding per faculty member has increased approximately five-fold. Science and engineering departments have added over 30 new faculty in the past six years and PhD. enrollments have increased by over 100% to more than 250 students. Finally, recent junior faculty awards include 5 Sloan Fellows and 3 NSF Presidential Young Investigators.

H.S. Pilloff
Code 1112LO
Tel. (703) 696-4223

20 APR 1993

Review of Resubmitted Earmarked FY 1992 University Grant: CONSTRUCTION FUNDING OF THE NATIONAL CENTER FOR COMPLEX SYSTEMS, submitted by Brandeis University
(Reviewed by Drs. H. Hawkins (Chair), T. McMullen and T. McKenna, Office of Naval Research, Code 1142)

1. Project summary: The proposal is for the release of $2,000,000 funding towards the construction of a new facility on the Brandeis University campus: the National center for Complex Systems. The requested total would cover total project costs for approximately a two to three month time period during facility construction. Of the total cost, $1,944,470 are for construction, $11,320 are for Clerk of the Works, $32,750 are for A/E Fees, and $11,460 are for Administration/Personnel.

2. Potential contribution to the national scientific and technical posture: The proposed effort will make a significant contribution to the national scientific and technical posture. This contribution will be enabled by construction of the National Center for Complex Systems, which will enable cross-fertilization of ideas among researchers drawn from diverse academic departments (Computer Science, Biology, Biochemistry, Physics, and Psychology) to: (1) advance understanding of cognitive processes, perception, neuroscience, and parallel computation; (2) develop and apply parallel computer systems and methods for computational modeling of neurons, neural systems, and intelligent behavior; (3) transfer advances in the cognitive and neurosciences to improve design of computer hardware and software architecture in order to develop computational systems that are faster and better suited for building intelligent systems; (4) facilitate technology transfer of powerful and novel computational models and neuroscientific knowledge to a wide variety of complex systems and novel emerging technologies in the areas of computation and communications, biotechnology and medicine, education and training, and engineering; and (5) train a new generation of scientific researchers to lead advances in multidisciplinary sciences of the future.

3. Quality of actual proposed research funded by this grant. The grant does not fund research: it contributes toward construction of a facility for the conduct of research. The research to be conducted at the facility addresses leading edge issues in the disciplines represented at the Center.

4. Quality of the researchers doing any proposed research. The researchers that will comprise the Center's faculty are uniformly outstanding in their fields, and can be expected to contribute significantly to understanding of complex systems.

5. Relevance of proposed effort to DoD and the return on investment. The different branches of the DoD have traditionally supported many areas of research that currently take place within

the National Center for Complex systems. A strong return on investment can be anticipated, particularly in DoD-related areas of cognitive and neural sciences, computer science, and biological science.

6. The reasonableness of the proposed costs, excluding construction. The majority of the proposed costs are for construction. The remaining costs are reasonable.

7. Unique features of the proposal. The most unique features of the proposal are (1) the strong commitment of the University to the proposed Center, reflected by its commitment to provide approximately $14,000,000 in addition to that requested from the DoD for support of the planned construction, and (2) the uniformly high quality and productivity of the faculty that will form the backbone of the Center.

8. Benefit of duplication of proposed facilities if they are not unique. The proposed facilities are, for the most part, unique. Research and training space will be provided that is otherwise not available. In addition, the facility will enable collaborations and interactions that can be expected to contribute significantly to the quality and breadth of effort at the Center.

9. Utilization and sustainability of the proposed project (facilities, equipment, personnel) after DoD funding is complete. The University has committed to maintenance of the facility, once constructed, and to the continued support of the Center's faculty, staff and equipment.

10. Geographic considerations that enhance desirability of the proposal. The Center will be located in Waltham, Mass., placing it near other centers of excellance in the academic disciplines forming the Center's focus.

11. History of excellence of the institution in the technical area. Brandeis has a strong history of excellance in the fields contributing to the center. It's current faculty is outstanding in all areas, and has made significant contributions therein.

12. Other compelling rationale (e.g., educational, infrastructure, etc.) The study of complex systems increasingly is becoming interdisciplinary. The proposed facility will provide students the opportunity to develop the cross-disciplinary perspective and competence that will be required in this field.

Harold Hawkins

Review of Resubmitted Earmarked FY 1992 University Grant

The University of Minnesota: Research Laboratory Facilities Development

Reviewed by Eric Eisenstadt (Chair; ONR Code 1141MCEB), Harold Hawkins (ONR Code 1142) and CDR Robert Hawkins (ONR Code 223)

1. **Project Summary:** This is a request for $10 M to provide partial funding for the construction of a Basic Medical Sciences/Biomedical Engineering Building on the Minneapolis campus of the University of Minnesota. The State of Minnesota and the University of Minnesota have authorized $52.7 M towards construction of the building. The State and University authorizations may be contingent on the DOD award.

2. **Potential contribution to the national scientific and technical posture:** The biomedical research activities of the investigators outlined in this proposal are of very high quality. Collectively, this award will greatly enhance the ability of this group of investigators to make significant contributions to the national scientific and technical posture in the biomedical sciences. The University of Minnesota is a leading institution for the transfer of technology to the private sector. A new research facility at the University of Minnesota Medical School will facilitate multidisciplinary interactions among its faculty, thereby conributing to technology development via the enhancement of basic research capabilities.

3. **Quality of actual proposed research funded by this grant:** The grant would not fund research. Rather it will provide funds for construction of a new research facility.

4. **Quality of the researchers doing any proposed research:** The investigators at the University of Minnesota who will carry out research in the new facility are of high quality.

5. **Relevance of proposed effort to DOD and the return on investment:** The basic research activities to be carried out in the new facility are broadly related to DOD interests. Many of the specific activities outlined in this proposal are directly relevant to current areas of research supported by ONR, including vision research, neural control of locomotion and movement, and computational approaches to nerve function. The multidisciplinary research supported by this new facility will leverage other federally funded biomedical research and provide a good return on investment in DOD-related areas of research.

6. **The reasonableness of the proposed costs, excluding construotion:** The funds will be used for construction of a new research facility.

7. Unique features of the proposal: A DOD award leverages a substantial contribution ($52.7 M) from State and University sources for the construction of an important new biomedical research facility. The multidisciplinary team of investigators will have some unique capabilities for working in areas such as computational neuroscience, sensory-motor integrative behavior, the study of single cell and simple nerve network organization, photoreceptor transduction, and visual cortical physiology and development.

8. Benefit of duplication of proposed facilities if they are not unique: Not applicable.

9. Utilization and sustainability of the proposed project after DOD funding is complete: The University of Minnesota is committed to the maintenance of the facility and will provide support for faculty, staff, and equipment.

10. Any geographic considerations that enhance desireability of the proposal: The facility will be located in the mid-West.

11. History of excellence of the institution in the technical area: The University of Minnesota has historically been one of the leading centers of research in the United States. For example, the cardiac pacemaker was developed at the University of Minnesota.

12. Other compelling rationale: Multidisciplinary research in the biological and medical sciences is essential for developing new scientific insights and technologies. The research facility proposed here will greatly facilitate multidisciplinary approaches to fundamentally important biological and biomedical problems.

Eric Eisenstadt

Eric Eisenstadt

OFFICE OF NAVAL RESEARCH

800 NORTH QUINCY STREET
ARLINGTON, VA 22217-5660

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October 21, 1994

The Honorable George E. Brown, Jr.
Chairman
U.S. House of Representatives
Committee on Science, Space, and Technology
Suite 2320 Rayburn House Office Building
Washington, DC 20515-6301

Dear Chairman Brown,

Thank you for sending me the transcript from the hearing on September 22, 1994. Noted below are errors found in the transcript that I would like appended to the official record:

page 30--line 710 remove comma after referred
page 31--line 732 $10 billion
page 31--line 735 comma before then and after
page 31--line 736 comma after perspective
page 31--line 741 little, if anything,
page 32--line 747 spoke of the great benefit
page 33--line 783 funds,
page 34--line 813 omit after, add of
page 35--line 823 comma after Could

Sincerely,

Mary Reap

Sister Mary Reap, I.H.M.
President

SMR/fdf

OCT 24

SAM HOUSTON STATE UNIVERSITY
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Billy C. Covington, Ph.D.
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October 20, 1994

Ms. Shirley Watson
Subcommittee on Investigations and Oversight
822 O'Neill House Office Building
Washington, D. C. 20515

Dear Ms. Watson:

In response to Chairman Brown's letter of October 4,1994, please find the transcription corrections marked in the enclosed document. Thank you for the opportunity to make these corrections.

If you have any questions about the corrections, please contact me at your convenience.

Sincerely,

Bill C

Billy C. Covington

The CHAIRMAN. We will now turn to Dr. Covington, Vice President for Research and Sponsored Programs at Sam Houston State University.

STATEMENT OF BILLY C. COVINGTON, Ph.D.

Mr. COVINGTON. Mr. Chairman, members of the committee, I am Bill Covington, Associate Vice President for Research and Sponsored Programs at Sam Houston State University. I want to thank you for the opportunity to provide information about the Texas Regional Institute for Environmental Studies which is headquartered at Sam Houston State University.

President An~~p~~isman sends his regrets, but he had a scheduling problem and could not attend.

I will try to respond sequentially to your five questions. In order to understand why earmarked funds were sought for the Texas Regional Institute for Environmental Studies, it is necessary to briefly describe the Institute and summarize funding conditions at the time the Institute was founded.

The Texas Regional Institute for Environmental Studies was formed by Sam Houston State University and Stephen F. Austin State University and provides for the inclusion of additional universities and non-university participants. The Institute is designed to bring together a broad spectrum of professional disciplines to address environmental issues.

In this interdisciplinary approach, natural and physical scientists work together with social scientists to understand the complexities of a given environmental issue and how various aspects of that issue affect the world from different perspectives. This interdisciplinary group gathers and interprets data on environmental issues, provides potential solutions for problems, and evaluates solutions with respect to effects of those solutions on matters pertaining to each discipline.

This approach reduces the possibility of implementing a quick solution only to discover that the proposed solution actually exacerbates the problems, transfers effects of the problem to another geographic locality and or temporarily delays the impact of that problem. With experience, such a program should lead to proactive policies in which environmental problems can be predicted and avoided.

We believe the Texas Regional Institute for Environmental Studies can serve as a model which can be developed, tested, improved and then implemented at additional sites nationwide. In 1999, when funds were initially sought for this program, existing funding agencies were not prepared to fund multidisciplinary and interdisciplinary programs. At that time administrative structures of granting agencies closely paralleled academic disciplines.

Proposals were reviewed within predetermined disciplines.

Incoming proposals were routed into a particular discipline, and if the proposal did not match that particular discipline it was rejected. There was little or no opportunity for review and funding of an interdisciplinary or multidisciplinary project.

Although many granting agencies remain structured essentially as they have in the past, an improving environment exist among Federal agencies for funding interdisciplinary programs. Opportunities to develop new ideas from interdisciplinary synergism are fueling the trend toward support of these new interdisciplinary programs.

We believe the trend bodes well for the funding agencies, for researchers and for the general public.

Benefits accruing to Sam Houston State University as a result of this funding rests primarily with the opportunity to expand educational and research endeavors. As a comprehensive regional university, Sam Houston State serves approximately 13,000 students from diverse academic and social backgrounds. Support for the Texas Regional Institute for Environmental Studies has provided additional faculty and staff for the university, and while these individuals spend time appropriate to their assignments on Institute research projects, their expertise is also available to educate students.

Many undergraduate and graduate students are directly involved in Institute research projects. Since much of the Institute's research is supportive of the Department of Defense programs, involvements of faculty, staff and students ~~opportunity~~ provides direct benefit to DOD.

Local, State and regional benefits of the Institute include expanding the foundation of expertise available to address local environmental issues and providing an economic stimulus to this rural area of east Texas.

As described earlier, the Texas Regional Institute for Environmental Studies takes an interdisciplinary approach to environmental issues with the goal of providing comprehensive solutions to an environmental problem and knowledgeable, proactive policies to avoid future environmental problems.

This approach is compatible with national goals and priorities as well as initiatives by the military services to develop integrated management plans. Most current Institute work consist of developing management plans for military installations. Given current trends, it appears there is national recognition that interdisciplinary, comprehensive planning with interagency cooperation is much more efficient than each discipline and/or agency working independently and often counterproductively.

Our interdisciplinary program began in an environment where it was one of a few, but is now one of many fledgling interdisciplinary programs, each with its own combination of features and any one of which might provide a model for future approaches to environmental issues.

Funds provided for the Texas Regional Institute for Environmental Studies through the Department of Defense have been used to provide a foundation from which the military can access the expertise residing with the personnel of the Institute.

In addition to the Integrated Management Plan's work underway on military installations, a number of other projects have been initiated. Several examples of these types of projects include award of funds from the State of Texas to develop interdisciplinary university environmental education programs and develop curricula to support environmental education programs for primary and secondary schools; development of recovery plans, Endangered Species Act Section 6 research, and completion of status reports in conjunction with the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department; formation of a consortium including private industry and Battelle Pacific Northwest Laboratories and supported by the U.S. Army to address munitions production waste. A pilot plant will be placed at the Radford Army Ammunition Plant.

Participation in informal endangered species consultation with the Texas Department of Transportation, U.S. Fish and

Wildlife Service, Texas Parks and Wildlife Department, U.S. Environmental Protection Agency, U.S. Soil Conservation Service, Texas Department of Agriculture, and other agencies to develop protocols to protect endangered species while allowing economic development such as road construction, ~~concern~~ agricultural practices and water treatment construction. This activity is based on proactive approaches involving all interested parties from the beginning, thus lessening the likelihood of protracted battles over these issues.

Further initiatives currently being developed include: development ~~after~~ of a concept to form an environmental extension network for small businesses. This network would bridge the gap between the U.S. Environmental Protection Agency and small businesses and would function similarly to the pattern between the Agricultural Extension Service and the agricultural industry.

Implementation of a program in environmental law enforcement; assistance to the Texas Department of Health in assessing impacts of environmental issues on public health, development after an environmental remediation process and technology transfer site, implementation of an environmental certification program.

The Texas Regional Institute for Environmental Studies operates under a protocol developed by the Department of

The CHAIRMAN. Thank you very much, Dr. Covington.

[The statement of ~~Mr.~~ Dr Covington follows:]

******** INSERT 3 ********

ACADEMIC EARMARKS—PART III

THURSDAY, OCTOBER 6, 1994

House of Representatives,
Committee on Science, Space, and Technology,
Washington, DC.

The committee met, pursuant to call, at 9:02 a.m. in room 2318, Rayburn House Office Building, The Hon. George E. Brown, Jr. [chairman of the committee] presiding.

The Chairman. The committee will come to order.

We understand, Dr. Deutch, that you have another urgent matter to help make the Congress happy this morning, and we are going to try and move as quickly as possible to get to that.

Mr. Deutch. I'm a little bit better off with time, sir.

The Chairman. We will proceed then.

This hearing is the third day of hearings that we have had recently on academic earmarks, and this morning we are going to hear from Dr. Deutch from the Department of Defense and from Mr. Vivona, the Chief Financial Officer at the Department of Energy, to discuss the situation in these two Departments.

Let me say briefly before recognizing you for your testimony, Dr. Deutch, that this is not intended to be an adversarial hearing, this is a friendly hearing, but we do recognize that you are caught in the middle between a couple of conflicting forces in the Congress, and we use these hearings to establish rather clearly what is happening with regard to earmarks and also to establish what we consider to be the philosophical, legal, moral, and other bases for what we are doing in connection with this situation.

The situation with regard to earmarks as we see it is an abrogation of the principles on which this country was founded and a violation of the Rules of the Congress. It is also undesirable to the Administration and violates many of the practices which the Administration has put in place. We say that because under our constitutional system of laws it is intended that the Congress be a democratic body and that its powers be exercised in a fashion based upon the rule of law and not on the rule of personalities.

It seems apparent to us that the processing of earmarking by a relatively few senior Members of one committee of the Congress violates this principle, and that is, when you get right down to it, there is no equity or justice or any other fundamental principle except the principle of applying brute power. You have got the power to do something, and you do it, and you yield to that out of a historical necessity to get along and under the pressure of threats that if you don't, you may be punished in subsequent appropriations cycles. That is a principle that Thucydides explained 2,500 years ago on the way the Greeks operated it during the Peloponnesian War when the Athenians fighting Sparta sought to enlist all the neutral city states in their camp, and in a confrontation with one neutral state, as reported by Thucydides, the Athenian says the strong take what they can and the weak yield what they must. In your confrontation with the Appropriations Committee, you feel that you are weak and you yield what you must.

Many Members of Congress take the same point of view, that in the confrontation with the Appropriations Committee we have to let them have their way because we will be subsequently punished by one form or another of deprivation of taxpayers funds. That whole process is basically immoral and runs contrary to the principles on which this country is founded. We do not intend to stop trying to discontinue that sort of thing. You get caught in the middle of this, and you try to adjust because you don't know who is going to win this fight basically, and you want to be on the winning side, and we understand that.

But I think it is important to have on the record that, assuming that I continue to be reelected, the fight will continue and that it will take many forms, including the securing of the necessary documents from your Department, publicity, hearings, the use of the media in every way possible, the changing of the House Rules, and any other steps necessary in order to make the system work in the way it was intended to work both to protect the questions of quality in the way we operate, improve the, in your case, the defense capabilities of the country through the proper expenditure of funds, and basically establish a situation in which all Members of Congress have some degree of equality in establishing what the will of Congress is.

You and others repeatedly refer to your efforts to do the will of Congress when what you mean is you are trying to do the will of a few Members of the Appropriations Committee reflected in nonlegal ways basically, report language, and frequently, not even that, but in letter or oral communication from Members. That is not the will of Congress, that is the will of a few Members of Congress who are seeking to convince you that they reflect the will of Congress, which they may or may not do.

Now this is just by way of background so that you will understand the nature of the situation that you are in, and we wish you the very best in extricating yourself from it.

But let me add one final thing. With regard to our request for documents from the Department, you repeatedly referred to your willingness to provide documents to the committees having oversight. It is not your role as the Department of Defense to determine which committees have oversight, that will be determined by the Congress and by whatever other instrumentalities are necessary.

We are acting on legal advice that we have jurisdiction over the matters that we request, and I have told you before, and I will merely repeat it here, that in the event you disagree with us we will resolve that through the normal fashion, we will go to the Floor of the House and determine whether we have it, and you may report that to your cognizant committees if you wish.

Now you may proceed with your testimony.

STATEMENT OF HON. JOHN DEUTCH, DEPUTY SECRETARY OF DEFENSE, U.S. DEPARTMENT OF DEFENSE, WASHINGTON, DC, ACCOMPANIED BY DR. ANITA JONES, DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

Mr. DEUTCH. Thank you, Mr. Chairman. I first of all want to tell you how pleased I am to appear here before the committee.

The CHAIRMAN. Don't lie, John, just give us the facts.

Mr. DEUTCH. You know that I—20 years ago I used to spend an enormous amount of time before this committee, and in fact I am pleased to get back.

The CHAIRMAN. My respect for you goes back the full 20 years.

Mr. DEUTCH. If I could, I would like to submit my prepared testimony for the record, and I would like to make a few remarks which go, I think, more directly to the heart of the subjects that you are raising, Mr. Chairman.

First of all, I want to start by saying that I don't have to tell this committee how important research and technology is for the Department of Defense, that it supports both the short and long-term military capability of the Nation. Technology gives our troops military dominance that, as Desert Storm indicates, leads us to more rapid victories with fewer casualties.

Mr. Chairman, I am accompanied today by Anita Jones, the Director of Defense Research and Engineering. Yesterday Anita Jones presented a new strategy for support of technology base activities in the Department. It is a wise and thorough document which lays out how we are trying to run our technology programs to meet the changed circumstances of the world.

We believe that military technology is still moving rapidly and continues to be important for national security. Examples are stealth, precision strike, and modeling and simulation, and we are also cognizant that the programs of the Department of Defense, especially its basic research programs, and where universities are performers of that research program, that there are major contributions made to the long-term Nation's strength both in technology and education. The contributions the Department has made over time to computers, to electronics, and communications needs no elaboration here; it is just very apparent that the science and technology base of the country is in large measure due to the efforts of the Department of Defense.

What is our position on earmarks? Simply put, the Department of Defense opposes congressional earmarks that send research and development money to a designated recipient without passing through some executive branch or other review process, and it is this latter point which I think goes to your point, Mr. Chairman, about the democratic process. Our view is a procedural one, that earmarks circumvent some sort of a review process and that, in general, we believe that as a result there is a less efficient allocation of public money and that in a time of declining research and development dollars the diversion of these funds to earmarked projects is even more serious.

Now the trend in the earmarks in the Department of Defense budget has been climbing, but we believe that it is down significantly in fiscal—in the fiscal year 1995 budget, so at least in that regard the trend is in the last direction.

Why has there been this increase in earmarks? We believe that one of the reasons there has been an increase in earmarks has been the reluctance of past administrations to work with Congress to define technology investment properly for the country, that, for example, in dual-use technologies that Congress was seeking to have a way of working with the executive branch to design investment programs that were broader for the Nation's purpose, and the reluctance of prior administrations to consider those investment programs has been one of the reasons that earmarks have grown.

What I would like to do is to briefly say—offer advice, what can Congress do and then what should the executive branch do.

I believe that earmarks are basically a congressional problem, Mr. Chairman, I don't believe that they are basically an executive branch problem. Congress has the authority under law to direct spending in executive branch agencies. If Congress wants to spend money on performers or locations of direct interest to Members, they have the legal authority to do so. The method currently in use to earmark language in committee reports and to refer obliquely to designated recipients is not a straightforward matter to manage, as you noted. I don't believe, sir, that we accept direction orally or through letter, but when there is language, report language, or where there is oblique reference in either authorization or appropriations bills, we certainly do try to attend to the congressional intent, nor is the practice sometimes used, where there are more earmarks than funds available, easy to manage, so that choices are left to the executive branch agencies to make decisions among programs that have had interest specified in conference reports.

There is one point which I would like to take a slightly different view on, and that is, I frequently hear that the Appropriations Committees are the ones responsible for earmarks. This is not my impression, sir, this is not my impression. The moving force for earmarks are Members from the entire body of Congress who would like to do something for their districts. The Members who call me about earmarks and advocate their funding are not usually from the Appropriations Committee but they are those Members who have convinced—convinced either the authorizers or the appropriators to put a specific reference either obliquely or directly into their bill. The Appropriations Committees, in fact, usually leave language that permit us the flexibility to make the final decision.

The good news is that the earmark is rarely absolute, the bad news is that it places us in a very difficult position as an executive branch official to make a choice about what congressional intent is, but again I want to emphasize that the earmarks are always in congressional language, they are not separately communicated outside of the bill. In these cases, in all these cases, we are accountable for managing the public's monies for the public's general good purpose. We are therefore put at odds with individual Members of Congress whose interests are in the direct welfare of their districts.

Let me next turn, Mr. Chairman, to what I believe the executive branch can do. The first is that we have to assure that all of our research programs and grants are awarded on the basis of competition. We do not and should not permit indefinite renewal of past rewards. This gives potential new R&D performers the impression that they have an opportunity to participate in the research programs of the Department, and we are strong advocates of requiring competition for the research programs that we have.

Secondly, we believe that it is important for the executive branch, the Department of Defense, to work with Congress to establish programs that are needed, investment programs, whether that is facility construction, establishment of new centers at colleges and universities that are attempting to strengthen their research and education programs, or establishing centers that are for particular subject matter areas, that if we, with Congress, establish new investment programs and restrict competition in these new investment programs to institutions that qualify, we will offer a practical alternative to the major impetus for earmarking. This means that the Department of Defense will allocate a portion of their R&D program to new program areas that meet a broader range of needs than are the normal case in our research programs.

Finally, Mr. Chairman, let me say that we do work directly with interested Members to make sure that we find the most effective way to invest the public monies that we are responsible for, and, as you point out, it does place us in a very difficult position.

Let me stop there, sir, and answer any questions or go into any of these matters that you may wish.

[The prepared statement of Mr. Deutch follows:]

DEPUTY SECRETARY OF DEFENSE JOHN DEUTCH
EARMARKING OF RESEARCH AND DEVELOPMENT FUNDS
HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
OCTOBER 6, 1994

Mr. Chairman, members of the committee, it is a pleasure to be here. I hope our time together today will prove useful to you as you consider the difficult topic of the role of Congress in directing specific expenditures of research and development funds.

The Department of Defense is committed to maintaining a strong research and development program even as we reduce the number of new weapon systems we buy. We have been supported in that goal by the Congress. We believe, as you do, that wise spending in research and development is the key to keeping our technological edge over potential adversaries over the long haul.

The work of research institutions, particularly colleges and universities, remains an extremely important part of the Department's research and development program.

DoD funds 50 percent of the total federal R&D at universities and colleges in several major fields including computer sciences, electrical engineering, materials, and oceanography. DoD funds research at hundreds of universities, employing thousands of researchers across the country. University research has led to major developments such as the Global Positioning System, night vision (low light level TV, night goggles, and thermal imaging), computers and information processing, and virtual environments for training and education. The results impact civilian life as well; the National Information Infrastructure is enabled by past and continuing DoD-sponsored university efforts in networking, software, and computing. Research funded by the DoD has provided the trained scientists and engineers that not only serve our military needs, but those of the private sector as well.

As we see even from this brief recital, DoD university research is a key element of our military technological superiority; it is a source of the innovations that have given our military the finest equipment in the world and strengthened our economic security. In this time of constrained defense resources, we must rely even more upon the academic world to ensure that our future defense technology needs are met. Establishing a new infrastructure of defense-unique research is not only out of the question financially, it wouldn't work because limited, defense-unique research establishments could not hope to remain at the cutting edge of technology in all technologies vital to today's defense.

Defense-funded university research today thus plays and will continue to play a crucial role in determining our technological future. It is no surprise, then, that many in the Congress feel strongly about where and for what purpose R & D funds for university research should be spent. An earmark is the Congress' way to provide direction to the executive branch -- whether it's in R&D or another part of the budget. The Constitution makes it clear that the executive branch proposes and Congress disposes. I respect the right of the Congress to give direction about where and where not to spend money.

I am not claiming that DoD decisions should be considered infallible or held inviolate. But DoD research decisions are part of a balanced, coherent plan aimed at meeting the needs of our war fighters. Our dollars, our time and our effort are carefully allocated for the maximum return, based on the principles of competition, and peer and merit review. Disruption of this plan through diversion of dollars, staff or time carries a price. Therefore, off-program research earmarks, no matter how well intentioned or seemingly meritorious, must meet a very high standard

What we in the Defense Department seek today is a means of constructive engagement with the Congress on these issues. We must find a way of coming together on the best course for providing our men and women in uniform the technological edge they need. We oppose all efforts to divert defense dollars away from the vital needs presented in the President's budget.

The Department of Defense opposes Congressional earmarks that send the R&D money to a designated recipient without passing through some Executive branch review process. We believe the earmarks in general lead to a less efficient allocation of the public's money. At a time of declining R&D dollars, the diversion of funds to earmarked projects is even more serious.

In recent years the trend in earmarks in the Department's budget has been climbing, but we believe it is down significantly in FY95. The reason for the past increase in earmarks was the reluctance of prior Administrations to work with Congress to define technology investment programs, such as dual-use technology programs, that Congress generally thought deserved support.

Here's what the Executive branch can do:

-- Assure that R&D contracts and grants are awarded on the basis of competition. Indefinite renewal of past awards will not be permitted. This gives potential R&D performers the impression that they do not have an opportunity to compete against the larger, established research universities.

-- Work with Congress to establish programs that are needed investment programs, such as facility construction, the establishment of new centers at colleges and universities that are attempting to strengthen their research and education programs.

-- Work directly with interested Members to make sure that we find the most effective ways to invest in public purposes we share.

Each year, the Department receives numerous requests for information from committees and individual members of Congress. These requests range from questions by Members on issues of specific interest to institutional requirements for the submission of materials of defense budgets and programs to DoD's oversight committees. The Department of Defense, like other agencies, routinely provides required and requested materials to committees defined as cognizant oversight committees in the annual Defense Authorization Acts. For example, DD-1414s, DD-1415s, and DD-1416s are submitted directly to the House Armed Services Committees and the House and Senate Defense and Military Construction Appropriation Subcommittees. The Department believes that further distribution of these funds documents to other committees and members is entirely the prerogative of the recipient committees and congressional leadership. Therefore, earlier requests by the Chairman of the House Science, Space, and Technology Committee for copies of the DD-1414s, which summarize the congressional action on our budget requests and identifies those programs that are considered to be of special interest to the Congress, were provided to the committee through the office of the Speaker.

The Chairman has also requested briefings on two programs and copies of the acquisition documentation on two specific earmarks. My Comptroller has recently provided the acquisition documentation related to earmarks for the Oregon Institute for Science and Technology and for Marywood College, Scranton, Pennsylvania. The Advanced Research Projects Agency stands ready to brief Committee staff on the Experimental Evaluation of Major Innovative Technologies, and the Director of Defense Research and Engineering stands ready to provide a briefing on the University Research Initiative.

The Department fully respects the constitutional authorities of the Congress to determine how funds are to be spent. The Department of Defense, as do other federal agencies, works very closely with our oversight committees to respond to the Constitutional authority of the Congress to determine how funds are spent and programs executed.

We understand that periodically, congressional committees -- and the Department by implication -- may be confronted with questions of jurisdiction given the complexity of modern public policy and the far-reaching activities of the Department. However, we do not believe executive agencies can resolve such jurisdictional disputes. They are properly settled by the Congress itself.

In conclusion, a research and development program that is not well-thought out and coherent could fail to give taxpayers the greatest return on their dollars, as well as undermine the viability of peer and merit review. That's why I want to emphasize the need to find a process that will allow us to integrate areas of high congressional interest into our research program in the most productive way.

This process could also serve us on larger issues ahead in production of technology. We are seeing enormous changes. The old linear process in which ideas proceeded unimpeded from laboratory to application -- without much thought to its broader implications -- is plainly inapplicable today. The times require a kind of parallel processing. From the beginning of the innovative process, when the research agenda is designed, consideration must be given to economic, regulatory and political aspects of the intended use of that technology. In the future, we must thoroughly integrate technology into the larger world if we are to be successful.

This points all the more strongly to the need for a means of reaching a meeting of the minds between the Congress and those in the executive branch who are the stewards of new technology as each institution struggles to adapt to the times.

Ultimately, the success of the science and engineering enterprise requires the support of the public and the Congress. We stand ready to do our part to earn that support.

Thank you.

The CHAIRMAN. Thank you very much, Dr. Deutch. We do appreciate your sage advice, and you have correctly described the situation.

The point you make about earmarks coming from sources other than the Appropriations Committee and benefiting other than the Appropriations Committee is sound. We, in our effort to make the point we are making sometimes, present it in slightly more stark terms than you may feel is justified.

We are well aware that a large number of the Members of the Appropriations Committee as to earmarks, and including the chairman, seek to reduce them or eliminate them insofar as possible. Previous chairmen like our late Congressman Natcher was violently opposed to earmarks and kept them out of the bills that he was involved in.

We also know that many Members who are not on the Appropriations Committee plead with appropriators to include earmarks for their purposes in the bill, and I made some reference to this begging process that goes on. It is not an effort to achieve equity, it is an effort to get votes for the final bill, to spread around some of these earmarks, and that makes it no less undesirable because it operates in that way.

Many, as you pointed out, nonappropriators follow the practice of earmarking on authorizing bills. As long as it is contained in legislation, however, there is a process by which the Congress can exert control, by amending the language on the Floor, and that is frequently done. When it is contained in report language or other informal and nonbinding places in the process, it is not amenable to the consideration of the full Congress, and hence it is doubly noxious because of that.

Now with regard to the equity of this whole matter, our contention has been, and it is amply documented by the record that we have achieved, that about 90 percent of all the earmarks goes to about a dozen people or the districts represented by about a dozen people. In the case of defense earmarks, we have a chart here—and I'll put it in the record—that in 1994—these are defense academic earmarks; there are nonacademic earmarks which frankly we don't pay too much attention to, we leave that entirely to you, but we feel that the quality of academic research is badly defective when it is not subject to some quality control, and it is our jurisdiction to see that that kind of control is exerted.

For all defense academic earmarks in fiscal year 1994 which amounted to $281 million, $144 million, slightly over half, went to the State of Pennsylvania, and $114 million, about 40 percent, I guess, went to the 12th Congressional District of Pennsylvania. For 1993 the figures were $275 million for all academic earmarks. Pennsylvania received $58 million and the 12th Congressional District $33 million. Again, these are very substantial percentages of the total academic earmark.

For 1991 it was $129 million, $47 million—$48 million approximately went to Pennsylvania, and $12 to $13 million went to the 12th Congressional District.

Now if you can sense from that any degree of equity or distribution around the country, you have a much finer perception than I do, and I will have this inserted in the record.

Now, I am going to recognize Mr. Becerra if he is ready to participate in this enlightened discussion.

Mr. BECERRA. Thank you, Mr. Chairman.

Mr. Deutch, thank you very much for being here. I appreciate it, and I would like to associate myself with everything the chairman has said with regard to earmarks. I most strongly want to emphasize that I think the comment made that this is an issue to be dealt with by Congress is perhaps the most appropriate. It seems to me that the executive branch is caught in the middle and—but you are the folks that we can bring to testify, so I think that is why you are here.

Let me ask you a few questions about the 1992 appropriation earmark that apparently in most cases, I believe, of the 17, only 4 or 5 were actually found in compliance with the criteria to be funded by the Department of Defense, and subsequently by 1994, I believe the spring of 1994, after some assistance from the Department to the grant seekers, all of the 17 earmarked projects were funded.

Can you give me some indication of what happened between 1992 when most of the programs were not funded and in 1994 when Department of Defense changed its position and funded the programs?

Mr. DEUTCH. Well, I believe that if I recollect the set of academic—these are academic construction?

Mr. BECERRA. Yes.

Mr. DEUTCH. Were they in the bill or in bill language, do you remember?

Mr. BECERRA. Some in the bill, some in language, some not.

Mr. DEUTCH. Right. Well, they were—as I recall, there are two categories, two different sections of the bill where they were involved in, and I would have to go back and provide you for the record exactly which category applied.

[No information provided for the record.]

Mr. DEUTCH. What we did was, we looked at the conditions that Congress asked us to apply before we granted the money. We worked with the institutions proposing—to make sure that they had a proposal that conformed to the requirements under the Act and then made the decision to fund them.

Mr. BECERRA. Let me stop you now. The original decision was not to fund. At least, of the 17, I think 12 were not funded.

Mr. DEUTCH. But as I recall, this is a set of earmarks which were—there was a change in the management of the Department from Secretary Cheney to Secretary Aspin. So I think we looked at this set afresh when we came in and asked whether there was—whether they satisfied the two or three, as I recall, purposes that—that the Act said we had to match for them.

Mr. BECERRA. Let me follow up on what you just said. There was a change of management. Did the folks who reviewed those earmarks initially change with the incoming——

Mr. DEUTCH. No. No.

Mr. BECERRA. Okay. So the people that issued the first decision to fund or not fund the 17 earmarks did not change.

Mr. DEUTCH. The evaluators did not change.

Mr. BECERRA. The what?

Mr. DEUTCH. The individuals who did the evaluations of the several different proposals did not change.

Mr. BECERRA. So what changed that caused—within management that caused a rereview of the earmarks?

Mr. DEUTCH. I suspect that it was a decision that I made when I was Undersecretary of Defense. I would have to go back and really find out the specific set to know whether it is the one that I have in my mind, the one that you are referring to.

[No information provided for the record.]

Mr. DEUTCH. We looked at that set of earmarks, and we decided that what we would do is, we would work with each one of those individual institutions to assure that they qualified under the language of the committee report and then decided to grant them.

Mr. BECERRA. Is that something you would normally do with——

Mr. DEUTCH. Yes.

Mr. BECERRA [continuing]. Any grantee?

Mr. DEUTCH. No. It is something that we would normally do when we were acting under Congressional direction to give the grants—I mean the contracts—the grants in this case.

Let me remind you, what we are told to do is to give the contract, and it is of course money which has to be spent in that way because it has Congressional interest on it, and therefore we have the choice of either saying that it hasn't conformed, and we have done that in several cases, but I don't think in the particular set, the fiscal year 1992 earmark set——

Mr. BECERRA. Now when you say you were told by Congress to do this, to fund or to earmark the funds in certain ways, you are not saying in all cases it was statutory language, you are saying in some fashion you got word from Congress, and here I assume you mean some Members of Congress.

Mr. DEUTCH. No. No. Let me make it quite clear. It comes in three ways. One is as statutory language; secondly, as committee language where a specific recipient is designated and Congressional interest—Congressional interest is indicated, which means that the money cannot be spent for any other purpose; and, third, with more ambiguous—the third way it happens, in committee report—in committee report language where also Congressional interest is more obliquely—I'm sorry, the purpose, the recipient is more obliquely referred to, and then Congressional interest is indicated, and we are not able to spend the money unless we spend it on that purpose. Those are the three different ways. But there should be no impression that there is no external communication about recipients by letter or by voice outside of what is defined by the Congressional reporting language.

Mr. BECERRA. So let's take whatever was written either in statute or report language. As I understand it, each one of these projects had to undergo a review process.

Mr. DEUTCH. If the category that I recall—yes, that is correct.

Mr. BECERRA. I think all 17 had to undergo a review process, and it had to meet certain criteria that were set out. It was very general, I will admit to that.

Mr. DEUTCH. That is correct.

Mr. BECERRA. And that was done.

Mr. DEUTCH. Yes.

Mr. BECERRA. And of the 17, four or five were granted funding, the others were rejected because they had not met the review process.

Mr. DEUTCH. I don't think they were rejected. No action was taken on them, as I recall, because they had not met the review process.

Mr. BECERRA. When you say no action was taken, what does that mean?

Mr. DEUTCH. Just what it says. There was no letter sent out accepting or rejecting the proposal.

Mr. BECERRA. Are you saying that there was nothing either explicitly stated in writing or orally that those projects were being denied?

Mr. DEUTCH. That is my recollection, sir. I would have to check to be sure. That is my recollection.

[No information provided for the record.]

Mr. BECERRA. All right.

Mr. DEUTCH. Let me step back here for a moment, sir, if I may.

Is it all right, Mr. Chairman?

The CHAIRMAN. It certainly is.

Mr. DEUTCH. You know, I used to run a big university, a very big university, and we were great advocates of absolutely hands-off evaluation because we knew we had every advantage in terms of our intellectual and physical capital to perform research well and properly for the public good, and we are very proud of our record. But many of the institutions we are talking about here are struggling institutions from one part of the country or the other, and they see themselves and their representatives, their Congressmen and their Senators see them themselves as having a need to have some opportunity, and so while it is easy to paint the picture of somebody who is, especially a small college or university trying to do something which is immoral or trying to do something which is unethical, what they are really trying to do is to learn how to benefit themselves for their benefits and their district, and so when we worked with some of these smaller places to put together a proposal, I don't think it should be in all aspects of it regarded as just being a black outcome, a dark outcome.

Mr. BECERRA. And I think I agree with what you said. I don't think that anyone here believes that what we do in trying to fund some of these projects is just waste money.

Mr. DEUTCH. It is the process that is wrong, sir.

Mr. BECERRA. And I agree with you there.

Can you—I know we have had a chance to review some of the documents you have provided—and, by the way, thank you very much for doing so—but it seems to me that having reviewed the initial proposal submitted by some of these applicants for the earmarked dollars and the subsequent revisions that were made by these applicants after having heard that they were not receiving the funds initially, that very little if no change had occurred between the proposals, yet the process somehow went from a rejection to an approved funding of the program, and the one that sticks out most in my mind is Boston University.

Mr. DEUTCH. Well, I don't remember the Boston University.

The CHAIRMAN. I think this refers to the photonics lab.

Mr. DEUTCH. The photonics lab I don't remember the details of, but coming from Boston myself, I understand the problem. I don't know exactly. I'll have to go back and refresh myself on the photonics lab and how it was done.

[No information provided for the record.]

Mr. DEUTCH. Was that in the report language, or was that in the actual legislation?

Mr. BECERRA. In the statutory language.

Mr. DEUTCH. Sorry?

Mr. BECERRA. Statutory language.

Mr. DEUTCH. Statutory language. Well, if it was statutory language, as the chairman has noted, we have less ability to work with the problem, because the photonics was statutory language, wasn't it?

Mr. BECERRA. Well, but it is statutory language that requires a peer review process.

Mr. DEUTCH. Yes.

The CHAIRMAN. And Boston University is one of those small deprived colleges. It only ranks up in the——

Mr. DEUTCH. I'm going to say something that I shouldn't say, and that is that my own personal sympathy with Boston University in this matter is much less than other institutions.

Mrs. MORELLA. But that's my alma mater. [Laughter.]

Mr. DEUTCH. Well, be that as it may.

Mr. BECERRA. You could change the review process and perhaps come up with a different decision.

Mr. DEUTCH. Well, I will go back and read what the Boston University photonics language was in statute on this, but I'm sure it was designated as a matter of congressional interest, and refresh my memory on it.

[No information provided for the record.]

Mr. BECERRA. Let me ask you some of the things you mention in your written testimony. I know that there were some discussions earlier that this committee has had with the Department in attempts to receive documents requested, and I know the Department took the position that certain documents would be released only to the appropriating committee and the committee with immediate oversight over the issue at hand, and I know that some documents were released, quite a few documents were released to this committee, which was not perceived by the Department to have direct oversight or appropriation authority over the Department of Defense.

You mention that in your statement, written statement, on page 4 in that top paragraph: "The Department believes that further distribution of these fund documents to other committees and Members is entirely the prerogative of the recipient committees and Congressional leadership."

Can you give me some citation of authority for that particular statement?

Mr. DEUTCH. I cannot. I am not an attorney, mercifully. I am not an authority on Congressional procedure.

I will say that I do feel extremely caught in the middle on this subject and I would always follow the direction of the Congress or the direction of the leadership on Congress on this matter, and I have actually tried to resolve it. But this really is a situation where I am directly caught between the views of various committees, and I suggest here again that this is a Congressional matter, not one that has to do with the Executive Branch.

The CHAIRMAN. Would the gentleman yield to me briefly on that?

Mr. BECERRA. Of course.

The CHAIRMAN. I fail to see how you were caught in the middle of anything, Dr. Deutch. We made a request. It is backed up by legal opinion, which I will put in the record at this point, indicating that we do have jurisdiction.

[The opinion follows:]

CRS

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April 11, 1994

TO : Honorable George E. Brown, Jr., Chairman
House Committee on Science, Space, and Technology
Attention: Dan Pearson

FROM : American Law Division

SUBJECT : Analysis of Oversight Jurisdiction of House Science, Space and Technology Committee With Respect to Department of Defense Practice of Earmarking Appropriations for Particular Academic Research

Since December 1993, you have made repeated formal requests to the Secretary of Defense for copies of DD-1414 forms for FY 1992 and 1993 that were created by the Department of Defense (DoD) or the services for Research, Development, Test and Evaluation (RDT&E) accounts. The Committee's interest in the DD-1414's, and related forms, stems from the increasing amounts DoD RDT&E funds being allocated for dual use technology programs and civilian-oriented research projects. In particular, your Committee has been reviewing the Congressional practice of "earmarking" RDT&E funds for particular projects and/or academic institutions in annual appropriations bills and conference reports in an attempt to circumvent competitive procurement requirements.

You believe DD-1414's and related documents will provide information essential for your review of such earmarking. As described by Chapter 431 of DoD's Budget Guidance Manual, a DD-1414 is a document that "establishes the base from which reprogramming action may be taken. It identifies line items for each appropriation covered in the DoD Appropriations Act, except those appropriations having no budget activity subdivisions in the budget document (431.3.A)". The Manual provides detailed procedures for preparation of a DD-1414.(431.3.E). Specific instructions are provided for RDT&E line items. (431.3.E(4)). The information in DD-1414's forms the basis for preparation of a DD 1415-1 which is utilized for reprogramming actions requiring approval of congressional committees for "the application of funds, regardless of amount, which ... affect an item that is known to be or has been designated as a matter of special interest to one or more of the Congressional committees". Section 431.4.A.1(b). These, among other documents, appear relevant to the subject of your review.

You indicate, however, that some DoD officials have raised some questions with respect to the Committee's jurisdictional authority to conduct an oversight proceeding to secure such information. Our review of the House Rules governing your authority, and oversight and legislative actions taken pursuant to that grant of authority, indicates a substantial body of relevant precedents that appear to support your current initiative in this area. In particular, it appears that there has been a significant number of instances over the past decade of oversight and legislative activity with respect academic earmarks and DoD oversight. Moreover, your Committee shares jurisdiction with the House Committee on Armed Services over the "Technology Reinvestment Program", (TRP).

Under House Rule X, cl. (4), the Committee on Science Space and Technology is given subject matter jurisdiction over "(8) scientific research development, and demonstration, and projects therefor, and all federally owned or operated nonmilitary energy laboratories" and "(11) all energy research, development, and demonstration, and projects therefor, and all federally owned or operated nonmilitary energy laboratories". Like other standing committees of the House, your Committee is directed by House Rule X, cl. 2(b)(1) to:

> ... review and study, on a continuing basis, the application, administration, execution, and effectiveness of those laws, or parts of laws, the subject matter of which is within the jurisdiction of that committee and the organization and operation of the Federal agencies and entities having responsibilities in or for the administration and execution thereof, in order to determine whether such laws and the programs thereunder are being implemented and carried out in accordance with the intent of the Congress and whether such programs should be continued, curtailed, or eliminated. In addition, each such committee shall review and study any conditions or circumstances which may indicate the necessity or desirability of enacting new or additional legislation within the jurisdiction of that committee (whether or not any bill or resolution has been introduced with respect thereof) ...

In addition, the Committee is vested with the "special oversight function" of "reviewing and studying, on a continuing basis, all laws, programs, and Government activities dealing or involving nonmilitary research and development." Rule X, cl. 3(f).

Several instances of oversight and legislative initiative with respect to dual use of technology programs and to civilian-oriented research projects since the 1980's by your Committee may be referenced.

In 1980, the Science Committee was the jurisdictional committee for the Stevenson-Wydler Technology Innovation Act of 1980, Publ.L. 96-480, which established programs to encourage the transfer of technology from Federal Government laboratories to the private sector and state and local governments. In 1986 your committee was the legislative initiator of the Federal Technology Transfer Act of 1986, Pub.L. 99-502, which provided the basic law regarding cooperative research and development agreements for all federal Departments, including the Departments of Defense and Energy.

In 1989, the Science Committee was represented on the conference committee for H.R. 2461, the National Defense Authorization Act for Fiscal Years 1990-1991, Publ.L. 101-189, for the provisions of section 801, which established new requirements for the Critical Technologies Plan, and §§ 3131-3138, dealing with technology transfer provisions, which broadened the Stevenson-Wydler Act by extending to all government-owned, contractor-operated (Go-Co) laboratories performing research for the Federal Government the authority to enter into cooperative research and development agreements to transfer technology developed in Go-Co laboratories to the private section. See H. Conf. Rep. No. 101-331.

In 1990 Science Committee members were appointed to the conference committee on H.R. 4739, the National Defense Authorization Act for Fiscal year 1991 for consideration of Sections 802, 804, 804A, 1001, 1002, 1501, 1502 and 3130B of the Senate amendment, and modifications committed to Conference. Science Committee Members addressed Title X of the bill which established a new "Strategic Environmental Research and Development Program (SERDP) at the DoD". The objectives of SERDP included the transfer of environmental and energy-related research and technology developed by DoD to the civilian sector, and the increased access to data and data analysis capabilities for civilian use in addressing environmental problems. DoD funds were authorized to be used to conduct research and development for environmentally sound, efficient applications of energy technologies developed by DoD, for environmental cleanup or waste minimization technologies, and for environmental problems such as climate change and ozone depletion. Since the SERDP program explicitly intended to make DoD resources available to the civilian community for environmental and energy research, including university researchers and other government agencies conducting environmental research (such as EPA, NOAA, and NSF), such provisions were recognized as within the Science Committee's jurisdiction. See H. Conf. Rept. No. 101-923.

In 1991 Science Committee members were appointed conferees on the National Defense Authorization Act for Fiscal Years 1992 and 1993 for sections 801-805, 811, 907, 3132, and 3137-39 of the Senate amendment, and modifications committed to conference. Section 801 established a critical technologies development program which expressly included civilian technology development. In particular, the provision included a Dual-Use Critical Technology Partnership program, a Critical Technology Application Centers program, a Foreign Critical Technology Monitoring Clearinghouse, and an Overseas Technology Monitoring Grant program. Under the dual-use critical technologies program, which expressly included technologies that have "nonmilitary commercial applications," DoD was directed to enter into partnerships with industry and federal laboratories (including civilian laboratories) to provide for research and development of such technologies. Section 804 directed the Secretary of Defense to establish a Manufacturing Extension Program to promote a broad usage of improvements in manufacturing technologies, including civilian technologies. Section 805 established a program of grants to institutions of higher education to support manufacturing education and would have required the Secretary of Defense and the Director of the National Science Foundation to enter into an agreement for "carrying out" the grant program. Grants were not limited to defense manufacturing, but included manufacturing technologies which have broad civilian application. Section 821 directed the Secretary of Defense to submit to Congress a plan for DoD support for science, mathematics, and engineering education at all levels of education in the United States. Section 907 amended the composition of the SERDP Council created in the FY 1991 Defense Authorization Act on which Committee members were conferees. See H. Conf. Rept. No. 102-311.

In 1992 Science Committee members were appointed to the conference committee on the National Defense Authorization Act for Fiscal Year 1993 for consideration of sections 241, 4105, 4201-4203, and 4206 of the House bill, H.R. 5006, and sections 204, 801-806, 809, 810A, 837,839, 1112, 3139, and 3141 of the Senate amendment, S.3114. Recognized Committee jurisdiction pertinent here included provisions that affect the planning structure for defense conversion and reinvestment which has the goal, among other things, of stimulating the national civilian high technology base, *e.g.*, section 4105; provisions that would establish a number of programs intended to strengthen development of dual-use technologies to assist in the conversion of defense activities to production civilian activities, sections 4201-4203, and 4206, section 204 authorizing SERDP; sections 801-806 and 809 which were extended to enhance opportunities for conversion of defense dependent businesses and industrial and technology-base sectors to dual-use capabilities; and section 810A which directed DoD to issue regulations to encourage defense contractors to engage in industrial diversification planning and clarifies participants in defense dual-use critical partnerships. See H.Conf. Rept. No. 102-966.

In 1993 Science Committee members were appointed to the conference committee on H.R. 2401, the National Defense Authorization Act for Fiscal Year 1994 for consideration of sections 215, 262, 265, 1303, 1304, 1312-18, and 3105 of the House and sections 203, 233, 235, 803, and 3141-3148 of Senate bill 1298. Pertinent to the instant jurisdictional question the assigned sections included provisions concerning DoD funding of research and development centers; the DoD establishment of a University Research Initiative Support Program; reports required by DoD assessing the effectiveness of all defense conversion, reinvestment and transition assistance programs; and requirements for defense dual-use programs. See H. Conf. Rept. No. 103-357.

The Science Committee's longstanding interest in earmarks at DoD and other agencies may be traced back to the Committee's extended "Science

Policy Study" work of the mid-1980's, which included a number of in-depth hearings and comprehensive reports. Among those pertinent here are the following:

– Hearings, "Science in the Political Process" (Science Policy Study, Volume 8), before the Task Force on Science Policy of the House Committee on Science and Technology, 99th Cong., 1st Sess. (June 25, 26, 1985). Hearing included testimony of John R. Silber, President of Boston University, defending his pursuit of academic earmarks, as well as other mentions of DoD as a funding source for university research.

– Hearings, "H.R. 2823 - The University Research Facilities Act of 1985", before the Subcomm. on Science, Research and Technology of the House Comm. on Science and Technology, 99th Cong., 1st Sess. (July 30, Oct. 22, 24, 30, Oct. 22, 24, 30, 1985). Title III of the bill concerned funding for the university research laboratory modernization program in DoD and included recurring references to DoD support to university research.

– Hearings, "Federal Government and the University Research Infrastructure" (Science Policy Study, Volume 6), before the Task Force on Science Policy of the House Comm. on Science and Technology, 99th Cong., 1st Sess. (May 21, 22; Sept. 5, 1985). Presented a lengthy report by DoD on the history of DoD Support for university laboratories.

– Report, "Science Support By the Department of Defense" (Science Policy Study Background Report No. 8), prepared by the Congressional Research Service, Library of Congress, for the Task Force on Science Policy, House Committee on Science and Technology, 99th Cong., 2d Sess. (December 1986)(Comm. Print). The study examines historical, organizational, financial, and policy questions about military research, exclusive of development, test, and evaluation. Attention is given to the balance between total military and civilian research and development and to implications for the economy of defense research and development. Three chapters deal with an "Overview of DoD Support for Research at Colleges and Universities"; "DoD Research Performed in Universities and National Security Controls"; and "DoD Support of Independent Research and Development in Industry: Issues and Implications for Federal Support of Civilian R&D".

– Report, "Technology Policy and Its Effect on the National Economy", prepared by the Technology Policy Task Force for the House Comm. on Science, Space and

> Technology, 100th Cong., 2d Sess. (1988), H.Rept. No. 100-2093 (1988). In this report on how the United States can maintain a leadership position in technology, an entire chapter is devoted to the discussion of the role of defense-funded R&D in developing commercial products. The Task Force urged that DoD "use its research and development resources to promote commercial applications whenever possible". The report includes an explicit discussion of the role of DoD in developing technology for civilian uses.

CONCLUSION

In sum, a substantial case can be made that House rules and past Committee legislative and oversight activities support the propriety of the pending investigative request to DoD for DD-1414's and related documents. The foregoing review of legislative and oversight actions since the mid-1980's underlines a consistent recognition of Committee jurisdiction where the focus has been on DoD's funding of dual-use technology and, in particular, academic earmarking. Appointment of Committee members as conferees on these issues for each and every Defense Authorization bill since 1989 would, indeed, appear highly relevant to the question.

Morton Rosenberg
Specialist In American
Public Law

The CHAIRMAN. Now what instruction did you receive that we didn't have jurisdiction or that we shouldn't get the documents?

Mr. DEUTCH. The advice on which I was acting, sir, was that the normal practice is for us to provide this information to our authorizing and appropriating committees and that the mechanism for having that transfer to other people take place is through them. That is my understanding of the situation. If I am wrong about that, Mr. Chairman,——

The CHAIRMAN. Did you receive advice or counsel from a Member of the Appropriations Committee or the staff of the Appropriations Committee that you should not provide those documents?

Mr. DEUTCH. No, I did not.

The CHAIRMAN. Do you know of anyone who may have received that?

Mr. DEUTCH. I don't know of anybody who may have received that.

The CHAIRMAN. It is just your intuition that they would not want us to have it?

Mr. DEUTCH. No. No. Excuse me, sir. I received advice from my comptroller on the subject.

The CHAIRMAN. And do you know on what basis your comptroller made that kind of unheard of and unjustified opinion to you?

Mr. DEUTCH. No, but I will be glad to inquire of him and provide an answer for the record.

We did spend a lot of time thinking about this and what was the right way to do it. But I must say, sir——

The CHAIRMAN. I must say, Mr. Deutch, if you were guided in your decision by anyone from the Appropriations Committee you are in deep do-do.

Mr. DEUTCH. Well, I did not speak, as I said to you, and I repeat unequivocally, I certainly did not speak to any Member of the Appropriations Committee or the staff of the Appropriations Committee on this issue. I did also try, Mr. Chairman, to try and find others, leadership, which would give me some guidance on this and did not get it resolved.

Mr. BECERRA. Mr. Chairman, let me continue with that line of questioning.

Dr. Deutch, you are saying you spoke to the comptroller with regard to the release on documents to this committee and it was only the comptroller you spoke to for guidance on this?

Mr. DEUTCH. I think that is right, yes. In my Department, that is right.

Mr. BECERRA. By the way, what is the name of the comptroller?

Mr. DEUTCH. John Hamre. I think this is reflected in some of the correspondence with the committee.

Mr. BECERRA. It is.

The CHAIRMAN. Our information indicates the comptroller is not a lawyer, did not seek any legal advice, and may have been guided by some informal advice he may have received from other sources. Would you mind checking on that, too?

Mr. DEUTCH. I would be delighted to do so, and I don't mean to conceal from you my—I would also guess, although I don't know, that he did speak to appropriators about it. I don't want to pretend that that is not the case. But I will find out and let you know, sir.

[The information follows:]

THE DEPUTY SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-1000

25 OCT 1994

RECEIVED
OCT 26 1994
Committee on Science,
Space and Technology

George E. Brown
Chairman
Committee on Science, Space,
and Technology
2300 Rayburn House Office Building
Washington D.C. 20515-0542

Dear Mr. Chairman,

At the recent hearing of your Committee you asked me the basis on which the Department had responded to your request for information. I enclose the opinion of the Department's General Counsel on this matter that was requested as a result of your inquiry to me.

I will, of course, continue to be available to you to discuss this matter.

Best regards,

John M. Deutch

GENERAL COUNSEL OF THE DEPARTMENT OF DEFENSE
WASHINGTON, D.C. 20301-1600

DEP SEC DEF
HAS SEEN
/s/ JWD
OCT 25 1994

MEMORANDUM FOR THE DEPUTY SECRETARY OF DEFENSE

SUBJECT: Request from Congressman George E. Brown for Production of DD 1414s for Research, Development, Test, and Evaluation Programs for Fiscal Years 1992 and 1993

During the course of the recent hearing before the House Committee on Science, Space, and Technology, Congressman Brown, the Chairman of that Committee, asked you to provide a legal opinion about the provision of DD 1414s.

As you know, the documents in question had previously been furnished to the House Armed Services Committee, consistent with the established practice of the Department to furnish these documents to the Armed Services Committees and the Appropriations Committees. Here, however, Congressman Brown requested the information directly from the Department.

The Rules of the House of Representatives govern which committees may, in a given situation, assert jurisdiction over a given subject matter. Under those Rules, the Department has no institutional role in the internal processes of the House. Thus, in the face of a possible jurisdictional conflict between two or more committees of the Congress, the practice has been to inform the Congressional leadership of the issue for resolution. That was done in this case.

Because the Department has been given no role in construing the applicable House Rules, it is my view that the actions taken by the Department in this matter were reasonable and appropriate under the circumstances.

Judith A. Miller

Judith A. Miller

INSERT FOR THE RECORD
HOUSE COMMITTEE ON SPACE, SCIENCE & TECHNOLOGY
ACADEMIC EARMARKS III
PAGE 28/L641

The information follows:

The Comptroller's advice on this subject was based on the Department's responsibilities regarding congressional oversight of defense programs and budgets. Funds control documents are routinely submitted to the congressional defense oversight committees as defined in the annual defense authorization bills. Therefore, another congressional committee could obtain these documents by requesting copies from the cognizant oversight committees. This was articulated in the Comptroller's April 13, 1994 letter to the Chairman of the Science, Space, and Technology Committee.

The CHAIRMAN. Mr. Deutch, this may be the most flagrant and egregious case of where you have taken it upon yourself to adjudicate a problem which is a Congressional problem. Your duty is to respond to legitimate Congressional requests. This was a legitimate Congressional request. You chose not to respond to it on an inadequate basis, in our opinion, and if you can get a better opinion we would be glad to put it in the record. But that is a very serious situation. Proceed.

Mr. BECERRA. Thank you, Mr. Chairman.

Dr. Deutch, let me see if I can get a better sense of this. When you received the request from this committee to release documents, whom did you consult with in the Department on any action to be taken by the committee?

Mr. DEUTCH. My comptroller.

Mr. BECERRA. The comptroller.

Mr. DEUTCH. Yes, sir.

Mr. BECERRA. Anyone else?

Mr. DEUTCH. No. I think that is the only person.

Mr. BECERRA. So——

Mr. DEUTCH. I don't recollect speaking to anybody else about it. This is some time ago now and——

Mr. BECERRA. Your best recollection.

Mr. DEUTCH. I think I actually—if I'm not mistaken, I may have also spoken to the Chairman of this committee about it. Yes, I do recall calling the Chairman of the committee about it. Yes.

The CHAIRMAN. The chairman expressed great sympathy for your situation.

Mr. DEUTCH. I'm sorry, sir?

The CHAIRMAN. The chairman expressed great sympathy for your situation.

Mr. DEUTCH. That is what I recollect.

Mr. BECERRA. Let me continue then. So according to your best recollection, the only individuals that you spoke to would include the Chairman of this committee and the comptroller of the Department of Defense?

Mr. DEUTCH. That is all I recollect.

Mr. BECERRA. Okay.

Any reason to believe your recollection would get any better than it is today?

Mr. DEUTCH. Yes, there is. I mean I just haven't thought about the sequence of people who I spoke to about it.

Mr. BECERRA. Would there be documents that would help refresh your memory?

Mr. DEUTCH. No. No, there are no documents, I'm sure.

Mr. BECERRA. Okay. What would help refresh your recollection?

Mr. DEUTCH. Talking to my comptroller.

Mr. BECERRA. Okay. And the best you recall, what was the advice that you received at the time that you first approached the comptroller?

Mr. DEUTCH. Let Congress work it out.

Mr. BECERRA. Which meant what to you?

Mr. DEUTCH. That there were different views among the committees, both explicit and implicit, and that this was a matter between titans in Congress and that we should wait till Congress had worked it out. I still think that that is very good advice.

Mr. BECERRA. And you are under a legal obligation to respond to a request of a committee——

Mr. DEUTCH. Well, of course, I will respond under any legal obligation.

Mr. BECERRA. Do you believe that as you sit here today you are under a legal obligation to respond?

Mr. DEUTCH. I don't have any competence to make an answer to that statement.

Mr. BECERRA. Well, based on the level of competence that you have as the Undersecretary of Defense, do you believe—or it is actually no longer the Undersecretary; I apologize—the Deputy Secretary of Defense. Is it your belief that you have an obligation to respond to a request from this Committee?

Mr. DEUTCH. No, I think, sir, quite the contrary, I think you are under an obligation to decide what I have to do. I think it is up to Congress here, not up to me. I think that it is really quite unfortunate that—that I don't have a clear recollection on this, so my view on this—I don't want to express it too harshly—is, as the Chairman has said, we are caught in the middle. We try and do the best we can, but that is no way to run a business—I mean run a Government. I try and do the best I can and committed myself. As the Chairman correctly notes, I am obligated and have stated both in every possible way, I try and I think I have the reputation of cooperating with Congress, but here Congress is divided, Congress is divided on how to conduct itself, and we need to have clear direction.

The CHAIRMAN. Would the gentleman yield to me again?

Mr. BECERRA. Of course.

The CHAIRMAN. Mr. Deutch, that statement just doesn't ring with me. You received a legally supported request for documents, and you say you were caught in the middle. The middle of what? You said no one told you not to provide those documents.

Mr. DEUTCH. Mr. Chairman, I'm going to have to do some more—go back and talk with my counsel on this, but my own view is that there were a view that the obligation we had was to provide the documents, the particular category of documents, to our authorizing and appropriating committees, which we were perfectly willing and had done. In fact, as I understand it, our documents were present in Congress. It isn't as if we were withholding them from Congress. They were present with our authorizers and appropriators.

The CHAIRMAN. Well, Mr. Deutch, your actions have tended to circumvent the normal ways in which the Congress expresses itself. The normal way is for a committee which has legal jurisdiction to make a written request for documents within their jurisdiction and you respond to it.

Now you tell us, based upon no legal advice or no consultation with any other Members of Congress, that you couldn't do that. Now that is just completely un—it is difficult for me to understand how you could do that. Now if you came to me and said Mr. Murtha told you not to give them, then I could understand, but you had no communication with Mr. Murtha or anyone else. Your comptroller is not an attorney, he is a former employee of Senator Nunn, who happens to agree with us on this.

Now I want you to go back and find out just where the conflict arose. How did you happen to be forced into a position to declining a legal request from this committee?

Mr. DEUTCH. Sir, it was my impression, perhaps an incorrect impression, that because we had provided these documents to our authorizing committee and our appropriating committee, that the normal path——

The CHAIRMAN. Well.

Mr. DEUTCH. I will go back and check on it, Mr. Chairman.

The CHAIRMAN. Yes. You find out if you have a history going back to never providing documents in response to a request from any other committee.

Mr. DEUTCH. Yes, sir.

The CHAIRMAN. And any legal opinions that you are not allowed to provide documents to any other committees.

[The information follows:]

INSERT FOR THE RECORD
HOUSE COMMITTEE ON SPACE, SCIENCE & TECHNOLOGY
ACADEMIC EARMARKS III
PAGE 34/L778

The information follows:

Funds control documents like DD-1414 and DD-1415 have only been provided to the defense oversight committees. These documents are routinely submitted to the congressional defense oversight committees as defined in the annual defense authorization bills. Therefore, another congressional committee could obtain these documents by requesting copies from the cognizant oversight committees. There are no DoD legal opinions that either requires or prohibits the submission of funds control documents to non oversight committees.

The CHAIRMAN. Now you are making a point of the fact that these committees are your committees of jurisdiction, Appropriations and Armed Services. They are not the committees of jurisdiction. Jurisdiction over your Department resides within the Rules of the House, and it clearly specifies—and I'll cite—we will put the citation in the record—that on those matters involving nonmilitary research, which includes the university research initiatives, the manufacturing technology program, the experimental evaluation of major innovative technologies, and the technology reinvestment program, this committee has legislative jurisdiction and oversight jurisdiction.

[Rules of the House citation follows:]

Under the Rules of the U.S. House of Representatives, Rule X, Clause 3, paragraph (f) states that, "The Committee on Science, Space, and Technology shall have the function of reviewing and studying, on a continuing basis, all laws, programs, and Government activities dealing with or involving nonmilitary research and development."

RULES

of the

HOUSE OF REPRESENTATIVES

EFFECTIVE FOR

ONE HUNDRED THIRD CONGRESS

PREPARED BY

DONNALD K. ANDERSON

Clerk of the House of Representatives

JANUARY 5, 1993

(Rev 1-5-93)

(11) Meetings of Congress, attendance of Members and their acceptance of incompatible offices.

(12) National penitentiaries.

(13) Patent Office.

(14) Patents, copyrights, and trademarks.

(15) Presidential succession.

(16) Protection of trade and commerce against unlawful restraints and monopolies.

(17) Revision and codification of the Statutes of the United States.

(18) State and territorial boundary lines.

(19) Communist and other subversive activities affecting the internal security of the United States.

(m) Committee on Merchant Marine and Fisheries.

(1) Merchant marine generally.

(2) Oceanography and Marine Affairs, including coastal zone management.

(3) Coast Guard, including lifesaving service, lighthouses, lightships, and ocean derelicts.

(4) Fisheries and wildlife, including research, restoration, refuges, and conservation.

(5) Measures relating to the regulation of common carriers by water (except matters subject to the jurisdiction of the Interstate Commerce Commission) and to the inspection of merchant marine vessels, lights and signals, lifesaving equipment, and fire protection on such vessels.

(6) Merchant marine officers and seamen.

(7) Navigation and the laws relating thereto, including pilotage.

(8) Panama Canal and the maintenance and operation of the Panama Canal, including the administration, sanitation, and government of the Canal Zone; and interoceanic canals generally.

(9) Registering and licensing of vessels and small boats.

(10) Rules and international arrangements to prevent collisions at sea.

(11) United States Coast Guard and Merchant Marine Academies, and State Maritime Academies.

(12) International fishing agreements.

(n) Committee on Natural Resources.

(1) Forest reserves and national parks created from the public domain.

(2) Forfeiture of land grants and alien ownership, including alien ownership of mineral lands.

(3) Geological Survey.

(4) Interstate compacts relating to apportionment of waters for irrigation purposes.

(5) Irrigation and reclamation, including water supply for reclamation projects, and easements of public lands for irrigation projects, and acquisition of private lands when necessary to complete irrigation projects.

(6) Measures relating to the care and management of Indians, including the care and allotment of Indian lands and general and special measures relating to claims which are paid out of Indian funds.

(7) Measures relating generally to the insular possessions of the United States, except those affecting the revenue and appropriations.

(8) Military parks and battlefields; national cemeteries administered by the Secretary of the Interior, and parks within the District of Columbia.

(9) Mineral land laws and claims and entries thereunder.

(10) Mineral resources of the public lands.

(11) Mining interests generally.

(12) Mining schools and experimental stations.

(13) Petroleum conservation on the public lands and conservation of the radium supply in the United States.

(14) Preservation of prehistoric ruins and objects of interest on the public domain.

(15) Public lands generally, including entry, easements, and grazing thereon.

(16) Relations of the United States with the Indians and the Indian tribes.

(17) Regulation of the domestic nuclear energy industry, including regulation of research and development reactors and nuclear regulatory research.

In addition to its legislative jurisdiction under the preceding provisions of this paragraph (and its general oversight function under clause 2(b)(1)), the committee shall have the special oversight functions provided for in clause 3(e) with respect to all programs affecting Indians and nonmilitary nuclear energy and research and development including the disposal of nuclear waste.

(o) Committee on Post Office and Civil Service.

(1) Census and the collection of statistics generally.

(2) All Federal Civil Service, including intergovernmental personnel.

(3) Postal-savings banks.

(4) Postal service generally, including the railway mail service, and measures relating to ocean mail and pneumatic-tube service; but excluding post roads.

(5) Status of officers and employees of the United States, including their compensation, classification, and retirement.

(6) Hatch Act.

(7) Holidays and celebrations.

(8) Population and demography.

(p) Committee on Public Works and Transportation.

(1) Flood control and improvement of rivers and harbors.

(2) Measures relating to the Capitol Building and the Senate and House Office Buildings.

(3) Measures relating to the construction or maintenance of roads and post roads, other than appropriations therefor; but it shall not be in order for any bill providing general legislation in relation to roads to contain any provision for any specific road, nor for any bill in relation to a specific road to embrace a provision in relation to any other specific road.

(4) Measures relating to the construction or reconstruction, maintenance, and care of the buildings and grounds of the Botanic Gardens, the Library of Congress, and the Smithsonian Institution.

(5) Measures relating to the purchase of sites and construction of post offices, customhouses, Federal courthouses, and Government buildings within the District of Columbia.

(6) Oil and other pollution of navigable waters.

(7) Public buildings and occupied or improved grounds of the United States generally.

(8) Public works for the benefit of navigation, including bridges and dams (other than international bridges and dams).

(9) Water power.

(10) Transportation, including civil aviation except railroads, railroad labor and pensions.

(11) Roads and the safety thereof.

(12) Water transportation subject to the jurisdiction of the Interstate Commerce Commission.

(13) Related transportation regulatory agencies, except (A) the Interstate Commerce Commission as it relates to railroads; (B) Federal Railroad Administration; and (C) Amtrak.

(q) Committee on Rules.

(1) The rules and joint rules (other than rules or joint rules relating to the Code of Official Conduct), and order of business of the House.

(2) Recesses and final adjournments of Congress.

The Committee on Rules is authorized to sit and act whether or not the House is in session.

(r) Committee on Science, Space, and Technology.

(1) Astronautical research and development, including resources, personnel, equipment, and facilities.

(2) National Institute of Standards and Technology, standardization of weights and measures and the metric system.

(3) National Aeronautics and Space Administration.

(4) National Space Council.

(5) National Science Foundation.

(6) Outer space, including exploration and control thereof.

(7) Science Scholarships.

(8) Scientific research, development, and demonstration, and projects therefor, and all federally owned or operated nonmilitary energy laboratories.

(9) Civil aviation research and development.

(10) Environmental research and development.

(11) All energy research, development, and demonstration, and projects

therefor, and all federally owned or operated nonmilitary energy laboratories.

(12) National Weather Service.

In addition to its legislative jurisdiction under the preceding provisions of this paragraph (and its general oversight function under clause 2(b)(1)), the committee shall have the special oversight function provided for in clause 3(f) with respect to all nonmilitary research and development.

(s) Committee on Small Business.

(1) Assistance to and protection of small business, including financial aid.

(2) Participation of small-business enterprises in Federal procurement and Government contracts.

In addition to its legislative jurisdiction under the preceding provisions of this paragraph and (its general oversight function under clause 2(b)(1)), the committee shall have the special oversight function provided for in clause 3(g) with respect to the problems of small business.

(t) Committee on Standards of Official Conduct.

(1) Measures relating to the Code of Official Conduct.

In addition to its legislative jurisdiction under the preceding provision of this paragraph (and its general oversight function under clause 2(b)(1)), the committee shall have the functions with respect to recommendations, studies, investigations, and reports which are provided for in clause 4(e), and the functions designated in titles I and V of the Ethics in Government Act of 1978 and sections 7342, 7351, and 7353 of title 5, United States Code.

(u) Committee on Veterans' Affairs.

(1) Veterans' measures generally.

(2) Cemeteries of the United States in which veterans of any war or conflict are or may be buried, whether in the United States or abroad, except cemeteries administered by the Secretary of the Interior.

(3) Compensation, vocational rehabilitation, and education of veterans.

(4) Life insurance issued by the Government on account of service in the Armed Forces.

(5) Pensions of all the wars of the United States, general and special.

(6) Readjustment of servicemen to civil life.

(7) Soldiers' and sailors' civil relief.

(8) Veterans' hospitals, medical care, and treatment of veterans.

(v) Committee on Ways and Means.

(1) Customs, collection districts, and ports of entry and delivery.

(2) Reciprocal trade agreements.

(3) Revenue measures generally.

(4) Revenue measures relating to the insular possessions.

(5) The bonded debt of the United States (subject to the last sentence of clause 4(g) of this rule).

(6) The deposit of public moneys.

(7) Transportation of dutiable goods.

(8) Tax exempt foundations and charitable trusts.

(9) National social security, except (A) health care and facilities programs that are supported from general revenues as opposed to payroll deductions and (B) work incentive programs.

General Oversight Responsibilities

2. (a) In order to assist the House in—

(1) its analysis, appraisal, and evaluation of (A) the application, administration, execution, and effectiveness of the laws enacted by the Congress, or (B) conditions and circumstances which may indicate the necessity or desirability of enacting new or additional legislation, and

(2) its formulation, consideration, and enactment of such modifications of or changes in those laws, and of such additional legislation, as may be necessary or appropriate,

the various standing committees shall have oversight responsibilities as provided in paragraph (b).

(b)(1) Each standing committee (other than the Committee on Appropriations and the Committee on the Budget) shall review and study, on a continuing basis, the application, administration, execution, and effectiveness of those laws, or parts of laws, the subject matter of which is within the jurisdiction of that committee and the organization and operation of the Federal agencies and entities having responsibilities in or for the administration and execution thereof, in order to determine whether such laws and the programs thereunder are being implemented and carried out in accordance with the intent of the Congress and whether such programs should be continued, curtailed, or eliminated. In addition, each such committee shall review and study any conditions or circumstances which may indicate the necessity or desirability of enacting new or additional legislation within the jurisdiction of that committee (whether or not any bill or resolution has been introduced with respect thereto), and shall on a continuing basis undertake future research and forecasting on matters within the jurisdiction of that committee. Each such committee having more than twenty members shall establish an oversight subcommittee, or require its subcommittees, if any, to conduct oversight in the area of their respective jurisdiction, to assist in carrying out its responsibilities under this subparagraph. The establishment of oversight subcommittees shall in no way limit the responsibility of the subcommittees with legislative jurisdiction from carrying out their oversight responsibilities.

(2) The Committee on Government Operations shall review and study, on a continuing basis, the operation of Government activities at all levels with a view to determining their economy and efficiency.

(3) The Committee on Appropriations shall conduct such studies and examinations of the organization and operation of executive departments and other executive agencies (including any agency the majority of the stock of which is owned by the Government of the United States) as it may deem necessary to assist it in the determination of matters within its jurisdiction.

(c) Each standing committee of the House shall have the function of reviewing and studying on a continuing basis the impact or probable impact of tax policies affecting subjects within its jurisdiction as described in clauses 1 and 3.

Special Oversight Functions

3. (a) The Committee on Armed Services shall have the function of reviewing and studying, on a continuing basis, all laws, programs, and Government activities dealing with or involving international arms control and disarmament and the education of military dependents in schools.

(b) The Committee on the Budget shall have the function of—

(1) making continuing studies of the effect on budget outlays of relevant existing and proposed legislation, and reporting the results of such studies to the House on a recurring basis; and

(2) requesting and evaluating continuing studies of tax expenditures, devising methods of coordinating tax expenditures, policies, and programs with direct budget outlays, and reporting the results of such studies to the House on a recurring basis.

(c) The Committee on Education and Labor shall have the function of reviewing, studying, and coordinating, on a continuing basis, all laws, programs, and Government activities dealing with or involving domestic educational programs and institutions, and programs of student assistance, which are within the jurisdiction of other committees.

(d) The Committee on Foreign Affairs shall have the function of reviewing and studying, on a continuing basis, all laws, programs, and Government activities dealing with or involving customs administration, intelligence activities relating to foreign policy, international financial and monetary organizations, and international fishing agreements.

(e) The Committee on Natural Resources shall have the function of reviewing and studying, on a continuing basis, all laws, programs, and Government activities dealing with Indians and nonmilitary nuclear energy and research and development including the disposal of nuclear waste.

(f) The Committee on Science, Space, and Technology shall have the function of reviewing and studying, on a continuing basis, all laws, programs, and Government activities dealing with or involving nonmilitary research and development.

(g) The Committee on Small Business shall have the function of studying and investigating, on a continuing basis, the problems of all types of small business.

(h) The Committee on Energy and Commerce shall have the function of reviewing and studying on a continuing basis, all laws, programs and government activities relating to nuclear and other energy.

(i) The Committee on Rules shall have the function of reviewing and studying, on a continuing basis, the congressional budget process, and the committee shall, from time to time, report its findings and recommendations to the House.

(j)(1) There is established a bipartisan Subcommittee on Administrative Oversight of the Committee on House Administration, to be chaired by the chairman of the Committee on House Administration. All of the members of the subcommittee shall be members of the Committee on House Administration, one-half from the majority party and one-half from the minority party.

(2) The subcommittee shall receive all audit reports of the Inspector General and shall be responsible for providing oversight of the Clerk, Sergeant-at-Arms, Doorkeeper, Director of Non-legislative and Financial Services, and Inspector General.

(3) The Speaker, the majority leader, the minority leader, and the chairman and ranking minority party member of the Committee on House Administration shall be informed by the chairman of the subcommittee of any matter that, by reason of a tie vote, cannot be resolved by the subcommittee.

Additional Functions of Committees

4. (a)(1)(A) The Committee on Appropriations shall, within thirty days after the transmittal of the Budget to the Congress each year, hold hearings on the Budget as a whole with particular reference to—

(i) the basic recommendations and budgetary policies of the President in the presentation of the Budget; and

(ii) the fiscal, financial, and economic assumptions used as bases in arriving at total estimated expenditures and receipts.

(B) In holding hearings pursuant to subdivision (A), the committee shall receive testimony from the Secretary of the Treasury, the Director of the Office of Management and Budget, the Chairman of the Council of Economic Advisers, and such other persons as the committee may desire.

(C) Hearings pursuant to subdivision (A), or any part thereof, shall be held in open session, except when the committee, in open session and with a quorum present, determines by roll call vote that the testimony to be taken at that hearing on that day may be related to a matter of national security: *Provided, however,* That the committee may by the same procedure close one subsequent day of hearing. A transcript of all such hearings shall be printed and a copy thereof furnished to each Member, Delegate, and the Resident Commissioner from Puerto Rico.

(D) Hearings pursuant to subdivision (A), or any part thereof, may be held before joint meetings of the committee and the Committee on Appropriations of the Senate in accordance with such procedures as the two committees jointly may determine.

(2) Whenever any bill or resolution which provides new spending authority described in section 401(c)(2)(C) of the Congressional Budget Act of 1974 is reported by a committee of the House and the amount of new budget authority which will be required for the fiscal year involved if such bill or resolution is enacted as so reported exceeds the appropriate allocation of new budget authority reported as described in clause 4(h) in connection with the most recently agreed to concurrent resolution on the budget for such fiscal year, such bill or resolution shall then be referred to the Committee on Appropriations with instructions to report it, with the committee's recommendations and (if the committee deems it desirable) with an amendment limiting the total amount of new spending authority provided in the bill or resolution, within 15 calendar days (not counting any day on which the House is not in session) beginning with the day following the day on which it is so referred. If the Committee on Appropriations fails to report the bill or resolution within such 15-day period, the committee shall be automatically discharged from further consideration of the bill or resolution and the bill or resolution shall be placed on the appropriate calendar.

(3) In addition, the Committee on Appropriations shall study on a continuing basis those provisions of law which (on the first day of the first fiscal year for which the congressional budget process is effective) provide spending authority of permanent budget authority, and shall report to the House from time to time its recommendations for terminating or modifying such provisions.

(b) The Committee on the Budget shall have the duty—

(1) to review on a continuing basis the conduct by the Congressional Budget Office of its functions and duties;

(2) to hold hearings, and receive testimony from Members of Congress and such appropriate representatives of Federal departments and agencies, the general public, and national organizations as it deems desirable, in developing the concurrent resolutions on the budget for each fiscal year;

(3) to make all reports required of it by the Congressional Budget Act of 1974, including the reporting of reconciliation bills and resolutions when so required;

(4) to study on a continuing basis those provisions of law which exempt Federal agencies or any of their activities or outlays from inclusion in the Budget of the United States Government, and to report to the House from time to time its recommendations for terminating or modifying such provisions; and

(5) to study on a continuing basis proposals designed to improve and facilitate methods of congressional budget-making, and to report to the House from time to time the results of such study together with its recommmendations.

(c)(1) The Committee on Government Operations shall have the general function of—

(A) receiving and examining reports of the Comptroller General of the United States and of submitting such recommendations to the House as it deems necessary or desirable in connection with the subject matter of such reports;

(B) evaluating the effects of laws enacted to reorganize the legislative and executive branches of the Government; and

(C) studying intergovernmental relationships between the United States and the States and municipalities, and between the United States and international organizations of which the United States is a member.

(2) In addition to its duties under subparagraph (1), the Committee on Government Operations may at any time conduct investigations of any matter without regard to the provisions of clause 1, 2, or 3 (or this clause) conferring jurisdiction over such matter upon another standing committee. The committee's findings and recommendations in any such investigation shall be made available to the other standing committee or committees having jurisdiction over the matter involved (and included in the report of any such other committee when required by clause 2(l)(3) of rule XI).

(d) The Committee on House Administration shall have the function of—

(1) examining all bills, amendments, and joint resolutions after passage by the House and, in cooperation with the Senate, examining all bills and joint resolutions which shall have passed both Houses to see that they are correctly enrolled, forthwith presenting those which originated in the House to the President of the United States in person after their signature by the Speaker of the House and the President of the Senate and reporting the fact and date of such presentation to the House;

The CHAIRMAN. Now you go back and get an opinion to refute that if you can.

Mr. DEUTCH. Yes, sir.

Mr. BECERRA. Actually, Mr. Chairman, I would like to request that Dr. Deutch do us a couple of favors.

Do we have anything in the record—and I'm not sure of this, Mr. Chairman—that indicates what the opinion of—I guess the opinion of the comptroller is in regards to the release of documents?

Dr. Deutch, do you know if we received something from the comptroller expressing this opinion?

Mr. DEUTCH. I'm sure you have not, but I will make sure we get you something on that.

Mr. BECERRA. Will you be willing to provide this committee with an opinion from counsel from the Department of Defense as to the propriety of withholding documents requested by this committee as well?

Mr. DEUTCH. If you wish, that is fine.

Mr. BECERRA. Okay. And we can be more specific with the—the committee can submit a more specific request to you to make sure it is clear what is being requested in the opinion, but it seems to me it would be good to have in our hands an opinion from an authority, a legal authority from the Department of Defense, as to reasons for withholding documents requested by the committee.

Let me go back, and, Mr. Chairman, I know I'm taking more time than——

The CHAIRMAN. Let me just interject on that point, we have still not received a number of documents that we requested by letter some time ago. As long as you are having your counsel review the legality of such request, have him include those that you haven't provided, and if you can't find a good legal reason to withhold them, I suggest that you provide them.

[No information provided for the record.]

Mr. DEUTCH. We did provide the two documents——

The CHAIRMAN. You did, and we agreed that that was adequate for the time being, but that does not by any means invalidate the continuing request.

Mr. DEUTCH. Yes.

Mr. BECERRA. And I want to make sure my request is clear, and I hope it is the request of the committee, and that is that we receive a legal opinion from counsel from the Department of Defense, legal counsel, which addresses directly the issue of the Department's authority to withhold documents requested by this particular committee.

Let me—and I see that my colleague from California has arrived, so I will ask only one last question and yield time.

You mention in your written testimony on page 2, one of your last paragraphs, "I am not claiming that DOD decisions should be considered infallible or held inviolate," et cetera, et cetera. "Our dollars, our time, and our effort are carefully allocated for the maximum return based on the principles of competition and peer and merit review. Disruption of this plan through diversion of dollars, staff, or time carries a price. Therefore, our program research earmarks, no matter how well intentioned or seemingly meritorious, must meet a very high standard."

I'm puzzled because those 17 earmarks from 1992, most of them were rejected, and you are telling me that there was a change in management that occurred.

Mr. DEUTCH. Change in administration, yes.

Mr. BECERRA. Okay, change in administration, but no change in the evaluators of those 17 earmarked projects.

Mr. DEUTCH. Yes, sir. What happened was, again, if I recall the set we are talking about, that there were a set of conditions that had to be met before the grants should be awarded; that the decision was made to work with those institutions and their proposals. In that process, they got considerably better and were judged to—before they were granted, and it actually took quite a period of time for some of them to meet the criteria, and then the decision was made.

So—and here we enter—just let me refer back to my remark that there were a wide range of institutions, and some of them will undoubtedly be stronger as a result of it.

Mr. BECERRA. When—I want to key on the words "considerably better." Will you do me the favor—and I apologize that we have you sitting here when perhaps we should have others sitting here answering the more direct questions about earmarks, but would you do me a favor, since it was the Department of Defense that did make the decisions to allocate the fund for these earmarked programs—can you tell me on those 14 or 15 programs that were subsequently approved for funding that were initially rejected, can you specify how they were changed to make them considerably better from the first to the second?

Mr. DEUTCH. Yes, I can, because I mean, first of all, let me make it clear——

Mr. BECERRA. Actually, I would like that in writing. I don't wish you to go through all 12 or 13 or 14 at this stage. I know you have to leave.

Mr. DEUTCH. No, no, I do not have to leave. This is important to me. I'll tell you, I'm going to say something. I was responsible for the decision, there is no question about that, and I think we can quite well document, if—again, if I have the right set in my mind—that the proposals became much stronger, and we will be happy to do that.

But I want to step back for a moment, and I'm running the risk of doing something you are not supposed to do which is losing one's—I am against academic earmarks. Let me make it clear that I am against academic earmarks. Where they are happening is up here, they are not happening down with me, and you are putting on me the onus of all of these problems when they are happening up here.

Mr. BECERRA. Absolutely correct.

Mr. DEUTCH. With Members of the entire Congress, not just the Appropriations Committee.

Mr. BECERRA. Absolutely correct, and at some point—and I will say this as an individual Member of Congress—at some point those chairs should be filled not by folks from the administration, not by folks from the universities that receive monies, but by folks who serve here in Congress.

Mr. DEUTCH. Well, actually some of the folks from the universities should also be sitting here.

Mr. BECERRA. Okay. Well, we had a few a week or so ago, and they did admirably well in defending themselves.

But would you do us—Mr. Chairman, I make the request as part—as a Member of the committee—that you give us the information to substantiate——

Mr. DEUTCH. Yes. We will be happy to do that.

Mr. BECERRA [continuing}. How the different projects became considerably better from the first stage of review where they were rejected to the final review where they were accepted.

Mr. DEUTCH. We will be happy to do that.

Mr. BECERRA. I appreciate that very much.

[No information provided for the record.]

Mr. BECERRA. One last question, and I preface it by saying you are absolutely right that the folks that should be sitting at the table there are not just the folks that we have had so far.

You mention that it was your decision to fund these programs, and I think you are actually taking more of the load than you should. Was it your original intention that the review process that was ultimately employed by the Department of Defense be that which ultimately made the decisions on which programs to fund?

Mr. DEUTCH. I'm sorry, I don't understand the question.

Mr. BECERRA. Let me try to phrase it more coherently, and I may actually go right to it. Some time in 1993, did you and a few others from the Department submit to the Secretary of Defense a memorandum on this issue of the earmarks and disposition of the earmarks for fiscal 1992/93.

Mr. DEUTCH. Yes.

Mr. BECERRA. And was it your opinion that a broad interpretation of the programs in their assessment be employed?

Mr. DEUTCH. I don't understand.

Mr. BECERRA. Were you advocating for a broad review process in determining whether these earmarked projects be funded?

Mr. DEUTCH. No. I think at that stage, if I—do you remember the date? I mean you obviously have it.

Mr. BECERRA. April 8, 1993.

Mr. DEUTCH. April 8, 1993. As I recall, I was confirmed on April 1 of 1993. I don't want any negative impression to be left as a result of it being April Fool's Day, and so what I did was, I—in this particular case, I think that at that moment I was of the view that maybe none of these should be funded and I went and I spoke with my secretary, who is a former Member of this Congress, about what the lay of the land was and how one should think about all these problems, and that began my process of understanding how to deal with these marvelous issues.

Mr. BECERRA. Thank you.

Mr. DEUTCH. But I do remember the memo, and I do remember the occasion and——

Mr. BECERRA. Thank you so much for your responses and your willingness to provide some of the documents that we have requested and responses in writing.

Mr. DEUTCH. Yes, sir.

The CHAIRMAN. I would like to call upon either Mr. Royce or Mr. Smith if they desire to ask questions.

Mr. ROYCE. Thank you, Mr. Chairman. I just have one question for the deputy secretary if I could, and that would be: Will the Department of Defense continue to earmark facilities or fund research programs after the earmarks run out? I'm just interested in how you view this.

Mr. DEUTCH. Only on the basis of merit, sir. Only on the basis of merit.

Mr. ROYCE. Okay.

Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Smith.

Mr. SMITH. Mr. Chairman, no, I have no comments.

The CHAIRMAN. I do want both of you gentlemen to note that in a democratically controlled Congress we are giving hell to a democratically appointed Undersecretary.

Mr. ROYCE. Duly noted, Mr. Chairman, and you are doing a fine job of it. Don't let me slow you down.

The CHAIRMAN. But I want you to know that we are trying to be fair and we will pick on the Republicans too if we get a chance.

Mr. ROYCE. I anticipate just that, and I appreciate the job you are doing as chairman because I think this goes to an issue of great concern to this committee and these are questions that really need to be answered.

The CHAIRMAN. Mr. Deutch, we recognize that you enjoyed being here and would like to stay further.

Mr. BECERRA. Mr. Chairman.

The CHAIRMAN. Yes.

Mr. BECERRA. Over here to your right, your geographical right.

The CHAIRMAN. Geographical right.

Mr. BECERRA. Actually, since my colleagues didn't have any questions, I would like to ask one last set of questions.

The CHAIRMAN. Well, I will permit that, but keep in mind that not only are we solicitous of Dr. Deutch's time but we have another witness and we do have to adjourn the committee.

Mr. BECERRA. Yes. I will be brief in this line of questioning.

The CHAIRMAN. Please do.

Mr. BECERRA. It occurs to me that the monies for these earmarked programs was appropriated in 1992. They were. I guess, 12 or so of those 17 were initially rejected for funding. So I suspect the monies, whatever happened to them, were not utilized to fund those 12 or so projects. In 1993, late 1993—and I'll let you explain because I'm not sure of the process, but in 1993 these projects were funded or were approved, and in 1994 I believe the monies were actually let.

I'm looking at I guess it is that same memorandum, and I'm trying to determine how the money was distributed and from where it came, and I'm looking at the bottom—last page of that one memo that, after it specifies all the different programs, it has a note, and it does say the DOD has since advised ODDR&E that other funds will be—well, let me go up and read the entire note. "All of these university grants except the National Center for Acoustics, the West Virginia High Technology Corporation, and Bradley University were included in the $560 million transfer request sent to Congress on January 15, 1993, by President Bush to pay for costs associated with Operation Restore Hope," which was the Somalia operation, so monies were transferred, $560 million were transferred by President Bush from the account that was to be used for Operation Restore Hope. Those monies were transferred from Operation Restore Hope to pay for these earmarks.

It goes on to say, "The DODC has since advised ODDR&E that other funds will be transferred to finance Operation Restore Hope. The money listed in the transfer request is available for release pending a plan for expenditure."

Correct if me if I am wrong, and please do as much as you need to advise me on this, but it seems that some monies were taken from the appropriation under Operation Restore Hope for Somalia to pay for some of these earmarks and that there is an indication that other funds will be transferred to finance Operation Restore Hope to replenish the monies that were taken from the operation.

Mr. DEUTCH. What is the question here, sir? The question is—I'm a little lost.

First of all, the fiscal year 1992 money I think was either no-year money or two-year money, so we had time to use it; and, secondly, this goes back to the prior administration's view that none of these earmarks should be in defense or academic—programs should be funded at all, and if you recall, back at that time there was enormous hostility in Congress, including, I think, this committee, to the unwillingness of the prior administration to fund any of these investment programs. Therefore, there was continually—in reprogrammings, what they would do is put up these areas as sources, knowing that Congress would say no to them.

I don't know what happened at that time to this particular case, but the person who was responsible for this at the time, Alice Maroni, doesn't make mistakes, and I can assure you that it is all in order and that the funds, whether they went in or out because the Restore Hope reprogramming, the result is the same, a decision on whether to fund it this way or not.

I remember this memo very well, and it has an interesting history about education on this matter, that it was here—it was on the basis of this memo that I tried to understand what was possible to do in this area of earmarks, and it really is a very important—has an important memory for me. It also showed me how far one could go or not go in this matter.

Mr. BECERRA. And I probably was asking you something that was more appropriate for those who are within the Department making the decisions at that time, so I won't ask any further of you to respond because I think it would be difficult for you to read the minds of those who were actually making some of those decisions back then.

I thank you very much.

Mr. DEUTCH. We didn't do all of these anyway.

The CHAIRMAN. Thank you very much, Mr. Becerra.

Dr. Deutch, I do express the same views as Mr. Becerra about placing this great burden on you in view of your multiplicity of other responsibilities. In part you have been selected for this high honor of being crucified here because of your cooperativeness and your willingness to participate in it.

I hope that Dr. Jones has fully been brought up to speed through this exercise and that perhaps she can substitute for you in the future on our more narrowly focused efforts to understand the disposition of those matters within our appropriate jurisdiction.

Mr. DEUTCH. Thank you very much, Mr. Chairman.

Let me say two things. First of all, Dr. Jones has had her conversion in this matter and she is well versed in it, but also let me say that I will always be willing to come to this committee and speak to you about this or any other matter at all times, so you don't have to worry about me coming up here.

The CHAIRMAN. Well, we will try and be as sympathetic of your time demands as we can.

Mr. DEUTCH. Yes, sir.

The CHAIRMAN. I would just like to take slight umbrage at your appropriate effort to put the role for all of those problems back on the Congress. I at least want to share it with you because in the responses you have made to us, you have taken one side in this battle, you haven't been neutral. You would like to be neutral, I know, and I am going to give you the opportunity to be neutral. If you can find some legal justification for your taking the position that you did, I will admit that you were then neutral in this matter. If you can't, then I'm going to accuse you of taking sides in something that you shouldn't have taken sides in, and with that we express our great appreciation to you and hope that things will get better.

Mr. DEUTCH. Thank you, Mr. Chairman.

The CHAIRMAN. Yes.

Our next witness—witnesses are Mr. Joe Vivona, who is the Chief Financial Officer for the Department of Energy, and he is accompanied by Betty Smedley, the Controller of the Department of Energy.

We welcome you both here.

We do not have with the Department of Energy yet the same problems we had with the Department of Defense; that is, refusing to honor our document requests; and hence we start off on a somewhat better note, which of course may get progressively worse, I don't know, but we welcome you here, and you may present your statement, Mr. Vivona.

STATEMENT OF JOSEPH F. VIVONA, CHIEF FINANCIAL OFFICER, U.S. DEPARTMENT OF ENERGY, WASHINGTON, DC, ACCOMPANIED BY ELIZABETH E. SMEDLEY, CONTROLLER, OFFICE OF CHIEF FINANCIAL OFFICER

Mr. VIVONA.[1] I have just an opening thought, Mr. Chairman. I know that Dr. Martha Krebs appeared before the Committee a week or two ago. We in the Department understand that this is a very difficult issue; and, last, both Betty and I will try to answer any of your questions.

Thank you.

The CHAIRMAN. All right.

Would you care to say a brief word of welcome?

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[1] Both Mr. Vivona and Mrs. Smedley have requested changes to their testimony, see appendix C, item 1.

Mrs. SMEDLEY. We appreciate the opportunity to be here, Mr. Chairman.

The CHAIRMAN. I'll bet you do.

Now we have with the Department of Energy received what we consider to be fair responses to our efforts to conduct our oversight duties with respect to earmarking in the Department of Energy. The Department of Energy is one of the most abused Departments in terms of earmarking. You have funded more hospitals, research facilities not related to energy, and other things of that sort than almost any Department. Certainly compared to the Department of Defense, I think you have been a real patsy for Members of Congress who like to do earmarks, and of course we are trying to save you from that great burden in the future.

You have taken the position, however, and this is contrary to the Department of Defense, that you have no obligation or desire to engage in a process of quality review on these earmarks, despite our suggestion to you that something of this sort would conserve the resources that the public entrusts to the Department and would provide better results from the use of those monies.

We had suggested to the Department a process of review which is similar to what is done in some other Departments, and the reaction that we seem to get from the Secretary is that they do not feel that this is justified, that in effect the Department of Energy feels safer in just cutting a check for whatever indicated earmark occurs, and that is whether it is in the bill, in the report language, or possibly coming from some other direction.

You may comment on this if you wish.

We have received from some Departments indication that they have allocated money to projects based upon conversations with staff members of the Appropriations Committee. Dr. Deutch denies that that occurs in the Department of Defense, and you may want to start out by denying that that occurs in the Department of Energy, and if we find that your denial is contradicted by the facts, you are in deep trouble, but you at least deserve the opportunity to deny it.

But the point that I am really making here is, why do you find it so difficult to engage in a process of review and standard setting for earmarked projects when apparently the Department of Defense is able to do this without too much serious repercussions?

Mr. VIVONA. Well, in answer to your, I think, first or second question, to the best of my knowledge, we fund academic earmarks only as prescribed statutorily or in report language, but we will double check.

Second, once we receive an academic earmark, our internal process attempts to ensure that the projects themselves meet two things. One is, we try to make sure that the level of academic excellence funded achieves the highest level possible within that context, understand that it was not part of our budget request but was placed into either report language or placed in statutorily.

Second, we do make an effort to work with the program, the university, institution involved, to make the project as relevant to the missions of the Department of energy to the extent possible. Again, they are normally not part of our priorities, they are placed in through language.

I should point out that historically pre-1993, the level of academic earmarks in the budget ranged up to $150 million or $160 million. Since this debate began, the level has dropped dramatically. Two points. One is, the combined total of earmarks——

The CHAIRMAN. You are referring just to the Department of Energy, I trust.

Mr. VIVONA. Yes.

The CHAIRMAN. Yes.

Mr. VIVONA. With respect to academic earmarks, the combined total over the last two years is about 50 percent of the total we received in 1993, and I think it is largely associated with this debate. It is, in fact, for 1995 only 30 percent of the total we received just two years ago. So I think the initiative is working.

Also, our interior appropriation no longer includes academic earmarks, as luck would have it.

The CHAIRMAN. We appreciate that report.

We have noted that there has been a decline overall in earmarks. It isn't universal or uniform throughout all the budget categories, but there have been some improvements, and we welcome this, and we welcome the actions taken by the Department of energy to attempt to reduce these if, in fact, you have been trying to do it.

Do you have any feeling, or would you like to defend the proposition that these earmarks represent a noble gesture on the part of Congress to provide equity and justice in the distribution of funds to academic institutions?

Mr. VIVONA. I worked at a university that attempted to get from a State legislature what would be called academic earmarks, and at the time when making the defense outside of the world of peer review and very aggressive competition they seemed to be justified. I certainly do not—without knowing about it to the extent that I would like, I do not believe that they are malintended allocations, I think they are designed to help an institution.

The question is whether they are related to the programs that we are best at providing. Are they energy related or associated with some of our missions, and do they—are they developed in a way that maximizes academics excellence. I think we can work within that framework to try and achieve those things. But as we have pointed out, I think most recently in a letter to you, [because they lack peer review], we do not support the process of academic earmarks.

The CHAIRMAN. Do you ever attempt to fund programs that are earmarked, say, in a report from an authorizing committee? Say we pass a Department of Energy bill and in the report we say we think you ought to fund a nice new project in southern California. Would you pay any attention to that?

Mrs. SMEDLEY. Mr. Chairman, as I know you are aware, we normally do not get an authorization bill for our civilian programs. When, in the case of our defense programs, we do get an authorization bill, then we do attempt to comply with the language in those reports just as we attempt to comply with the language in the Appropriations Committee reports.

The CHAIRMAN. Well, I'm trying to be a little more specific than that. The defense authorization bill is intended to provide you policy guidance in the language of the bill. Referring more specifically to directing you to spend money for a specific project or program that is not in the language of the bill but is in the report language from the authorizers, do you recall any instances in which you may have done that?

Mrs. SMEDLEY. Mr. Chairman, I don't recall any instances of specific guidance in a report accompanying an authorization bill, but I know that as a Department it is our policy to carefully review those reports and to be guided by what is in them, so if there were a project so identified in a report accompanying an authorization bill, we would make every effort to try to follow the guidance.

The CHAIRMAN. But you don't recall any such specific guidance. You do recall it in appropriation bills.

Mrs. SMEDLEY. Yes, sir, I do.

The CHAIRMAN. OK.

Mr. Becerra, would you care to offer any questions at this point?

Mr. BECERRA. Sure.

Thank you very much for being here. I appreciate it.

I would like to ask some questions that relate to the correspondence dated October 4, 1994, that was received by the chairman of this committee from Secretary O'Leary. Do you have that letter before you?

Mr. VIVONA. Yes.

Mr. BECERRA. OK. Let me ask you to take a look at a few things. I would like to clarify some of the language in the letter.

At the bottom of the cover page where you get into the Department's process for funding nonstatutory academic earmarks, you state under number 1, "After the appropriations bills are signed into law, the Department's Chief Financial Officer carefully reviews Appropriations Acts and House, Senate, and conference reports to identify academic earmarks." What is meant by Appropriations Acts? Are you talking about acts of law—in other words, the statutes or actions by——

Mr. VIVONA. Yes, the appropriations bill.

Mr. BECERRA. So the word "acts" there should refer to the actual legislative act which would be the statute.

Okay.

Number two, you say each identified academic earmark is formally transmitted to the appropriate managing program for assessment. Define "appropriate managing program."

Mr. VIVONA. There are a number of programs within the Department, Office of Energy Research for example, that would be relationships relevant to the particular project or its placement in the bill itself.

Mr. BECERRA. So just jurisdiction.

Mr. VIVONA. Yes, within the agency.

Mr. BECERRA. Within the agency. And assessments—appropriate managing program for assessment. Define "assessment."

Mr. VIVONA. The report or statutory language may come to us with a specific dollar amount or calling for the provision of funds. That is what needs to be assessed. We try to follow up on the latter of those two on the following page where the amount is not specified. You need to define what you will do to provide for that particular academic earmark.

Mr. BECERRA. And do you have a structure to undertake this assessment, or is it done on an ad hoc basis? Is there some policy or some rules of procedure?

Mr. VIVONA. Well, again, I think we try to achieve academic excellence, we try to make it as relevant and related to the overall mission of the Department.

Mr. BECERRA. On the second page, the very last paragraph or second to last paragraph, you indicate that the Department and the administration remain opposed to nonstatutory academic earmarks and appropriately look to the Congress for its direction on this matter. Given that you oppose, what kind of direction are you seeking?

Mr. VIVONA. We would seek clarity or terms—or guidance in terms of how to proceed. We would seek evenness in terms of its application Government-wide. Largely due to the work of the Committee, our ration of dollars associated with academic earmarks has dropped dramatically. I think we might be in the 1 or 2 percent range, and there are larger issues, dollar issues not issues of principle, outside of the Department of Energy.

So we would seek that kind of agreement within the Congress as to how to proceed. Our advice would be that it be handled evenly, that is to say, applied evenly to all of the departments that are the recipients of academic earmarks either statutorily or through language—conference language.

Mr. BECERRA. If we requested from the Department some guidance on how to proceed so we could give you direction, given your opposition to nonstatutory academic earmarks, what would be your recommendation?

Mr. VIVONA. That would be our guidance. Since they fall outside of better—not perfect but better processes for allocating resources, the Department's advice is—or position is that we are not in support of academic earmarks.

Mr. BECERRA. So don't do them. If you are going to do them, give us clear direction on how to use them.

Mr. VIVONA. Correct.

Mr. BECERRA. Okay. In the paragraph right above that, you talk about earmarks that are directed without associated funding that the Department must reallocate resources within existing funding levels. "In all instances the Department strives to minimize the adverse impacts on ongoing mission programs and activities." Are you implying there that at times you have to redirect monies to be able to fund these earmarks which may impinge on funding for other statutorily directed projects and programs?

Mrs. SMEDLEY. What we are trying to say is that when we receive an earmark in report language, in some cases the Congress has taken the program in question and added the amount of money that they earmarked to the budget request, so that it is very clear that we are to do all of the things that are in the budget plus we are to do this new item. In other cases, the congress doesn't add the full amount of the earmark or appropriates perhaps less than the budget request but stays within the amount appropriated provide a specific amount of money for this particular project. It then falls to us to try to determine what program or projects we will not do or we will reduce our level of activity on to accommodate the earmark.

Mr. BECERRA. So is it accurate then to say that at times you find yourself in the position of taking monies from other programs or activities that have been authorized and appropriated for by Congress in order to fund some of these earmarks?

Mrs. SMEDLEY. I think that that—that is perhaps not correct. In effect, what we have been given is an appropriation for—we don't get line item appropriations, we get a lump sum appropriation, and then we get guidance as to how we are to spend that lump sum appropriation, and the Congress has given us—and we are talking report language now, we are not talking statute.

So the Congress in the report says that we are to provide a specific level of funding for an activity that was in our budget, and within that level of activity we are to support an item that wasn't in our budget. That is certainly within the prerogative of the Congress to do in reviewing our budget, to indicate they don't want us to spend the full amount of our request as we requested it, and, as I indicated, sometimes they give us specific guidance as to where they would like to make cuts in our budget, other times they don't, and we are—we get guidance that we are to make the reductions in a way that has least adverse impact on ongoing program projects and activities.

The CHAIRMAN. Would the gentleman yield briefly?

Mr. BECERRA. Of course.

The CHAIRMAN. Mrs. Smedley, we received recently—I don't have it right in front of me—a letter from the Secretary requesting reprogramming approval to fund certain earmarks and specifying the accounts authorized by the Congress and respecting an important Department program that would be cut in order to reprogram money. At this point I am going to ask unanimous consent to put that letter in the record reflecting that you do seek at least to take money from existing ongoing authorized programs to some hardship on those programs in order to fund the earmarks.

Now I have that one letter in mind because it occurred recently. There may be many others, and we may want to add to the record later. But I wanted to make clear.

You also continue to refer to Congressional guidance without too much distinction between the content of a piece of legislation and the report accompanying it. Now you are well aware and I think we have exchanged letters indicating that there is no legislative standing for report language, it does not compel you to do anything, and when you refer to that as being the guidance of the Congress you are speaking incorrectly. That reflects the view of whatever staff member of Appropriations wrote that report, and then of course some Members of the Appropriations Committee may even have read it and not objected to it, but it does not represent Congressional guidance.

Mr. BECERRA. Mr. Chairman, I know my time has expired so I will withhold any further questions and thank our panelists for their time.

The CHAIRMAN. I am pleased to recognize our distinguished Ranking Member, Mr. Walker, at this point.

Mr. WALKER. Thank you, Mr. Chairman.

On this issue of seeking guidance from the Congress with regard to a number of these earmarks, the discussion here has been interesting, and I know that that is the process used, that you end up with a block of money and then Congress tells you then, out of this block, you are to spend the monies certain ways. Is the way you now go about seeking the sign-off by the authorizing committees the methodology suggested by the chairman, that you then come back to us asking reprogramming authority? Is that the methodology used to seek approval from the authorizing committees?

Mr. VIVONA. Only if we must move money around to achieve it, but normally no, the money is specified.

Mr. WALKER. What would be your logistical problem in having a policy that says when you get earmarks from one committee, be it, say, an Appropriations Committee, in appropriations, that you would not fulfill those earmarks until you had gotten approval from the authorizing committee, or if the authorizing committee earmarked that you would not—that you would not spend the money until you had gotten approval from the appropriating committee? Would there be a logistical problem for you in putting in place that kind of a policy?

Mr. VIVONA. We have a policy that surrounds academic earmarks and extends to things other than academic, and also to policy matters where we receive language, we attempt to follow it. That is the overall guiding policy.

Mr. WALKER. Yes, but the way you do it now is—let's say this committee goes on a surge of earmarking and we just send down our authorizing bill and we have got earmarks coming out the back and the front of the report. Now at that point, if we can manage to get that through the Congress and get it passed, if I understand your policy now is, you just say, okay, that is what Congress is demanding of us, we are going to spend the money.

Mr. VIVONA. Well, again, the recent history, the three-year history of academic earmarks has been that they have declined dramatically. They have gone—for the Department of Energy, not speaking for the other agencies—the Department of Energy has gone down to 30 percent of the level that it was at in 1993.

Mr. WALKER. Yes, but in all honesty, in large part because of the courage of George Brown.

Mr. VIVONA. That was acknowledged earlier.

Mr. WALKER. You know, that is the reason why they are going down, is because you have had a chairman that has been willing to stand up against this because he realized that this was destroying the science base of the country. Somewhere along the line you are likely to get it coming back, and I'd like to think that we could put in place a policy that doesn't demand always a handful of people in the House or in the Senate trying to stand up against the flood, that the Departments themselves would say this is bad policy, this is not something that should be done, and at the very least we ought to have both authorizers and appropriators sign off on anything before we put it into effect, and I'm asking you what are your logistical problems in getting that done?

Mr. VIVONA. I would suggest that it is more related to the level. We think that it is something that the Congress is best able to handle. We are not in the position to handle it. It is a matter of getting guidance on the issue of academic earmarks from the

House and the Senate where there may be disagreements within that body regarding the treatment of academic earmarks.

Mr. WALKER. You can make a policy on this. You are in a position to be able to make some of those decisions. If that were your policy with regard to earmarks, it would be understood that that is going to happen. The fact is that what usually happens on this—and it isn't even much Member involvement. I mean in most of these agencies, and to some extent I'm blaming the wrong people here, but I have seen instances where you end up being under the thumb of some Senate staffer or some House staffer of the Appropriations Committee, it is not even the Members that are in touch with you.

I mean if you have a staff member calling you and saying, "Let me tell you what this language in the report means, it may be a little unclear to you, but let me tell you exactly what we intend for you to do," and we have got agencies that say, "Well, if that's what you intend, then that's what we are going to do," and we don't find out about it until months later even on the authorizing committee, and I'm saying, that is not even direct commands, that is kind of indirect commands through staff saying that this rather undefined language means that you are to pump money into the chairman's district, and time and time again agencies react to that.

Now what I am suggesting is, there must be some kind of policy that could assure that there is a broader base than a couple of staff Members on Capitol Hill that sign off on these things before they take place.

Mr. VIVONA. If there was an attempt to direct us in that fashion, we would not be involved in that, we would compete the project. We react very directly to conference language, not to the—and I have never received a call in this regard, although I have only been around for four or five months.

Mr. WALKER. You will.

Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Barca.

Mr. BARCA. I wonder in terms of policy that the Department of Energy has established, you know, per the letter that was given to us by the Secretary, it indicates that this is your express policy, to comply with report language. Has that always been the policy of the Department of Energy? Is there something in writing that exists that transcends Administration to Administration?

Mr. VIVONA. It has been the Department of Energy's policy.

Mr. BARCA. Since the inception of the Department of Energy?

Mr. VIVONA. It has been 14 years, as far as we know on this table.

Mr. BARCA. OK.

Then secondly, the question I would have is that, generally speaking—well, I think probably exclusively speaking based on what we have heard—you are talking about the report language that accompanies appropriation reports. Now what if—would your policy be the same if, let's say, accompanying a Budget Act, in the Budget Act report, if there were a similar kind of earmark put into report language for the Budget Act report, would you treat that exactly the same?

Mr. VIVONA. We try to follow the guidance, again, within the constraints of what the dollars allow in the appropriations bill.

Mr. BARCA. All right. I'm asking a different question though. I'm asking that if in the budget—pardon me?

Mr. VIVONA. Or an authorization bill, for example, is what you might be referring to.

Mr. BARCA. The other point I want to just raise is, when we had the EPA before our committee, they had given us some documents to our committee that had given us the distinct impression that they had awarded funding to a given academic institution where there was no report language, where there was no statutory language, but strictly on the occasion of a person calling saying that that was what the committee intended to have occur. To the best of your knowledge, has that ever occurred in the Department of Energy?

Mr. VIVONA. That has not occurred. We promised the chair that we would triple check it, but in preparing for this hearing that was an issue. We discussed it in-house, and it is not the case.

Mr. BARCA. And your policy would be to not allow that to occur should it happen in the future.

Mr. VIVONA. Yes.

Mr. BARCA. In this policy that we are referring to, is that a written policy that you have some place that you could share with the committee? Is that written up?

Mr. VIVONA. It has certainly been the practice. I can check if we have ever said it in writing, but I'm sure in reacting over the two-year period with which this issue has really been highlighted, we have stated it in correspondence on several occasions. It is the stated policy.

Mr. BARCA. You had said, if I understood you correctly, that really since the inception of the Department of Energy it has always been the policy of the Department of Energy to do this, and I just wonder, is there a written policy some place that we could get a copy of so we could get a better understanding of this policy?

Mr. VIVONA. We do it by way of what we call budget guidance internally. We do it internally by way of budget guidance, but we don't have a policy directive.

Mr. BARCA. Okay, so there is not a policy directive.

Mr. VIVONA. Specifically to earmarks.

Mr. BARCA. So in other words, there is not a written policy. There has never been a policy directive from the Secretary or some written policy to——

Mrs. SMEDLEY. We have a budget manual that is operative in the Department which provides general guidance on how we are going to execute the budget in accordance with the direction that comes from the Congress. As far as lines specified in the Appropriations Committee reports, we certainly don't have a specific policy titled academic earmarks, but our budget execution policy sets thresholds against which we will control our money to execute our budget in accordance with the direction that the Congress had provided.

Mr. BARCA. OK.

Have you ever—have there ever been instances where there has been just a real tremendous gray area in terms of the report language where it has just been completely unclear, where you have sought counsel's opinion in terms of whether or not you should comply or how you should handle that particular circumstance?

Mr. VIVONA. Betty Smedley, the Controller, has been around for 14 years or so, and she doesn't recall.

Mr. BARCA. Any instance where that has occurred?

Mr. VIVONA. Correct.

Mr. BARCA. Okay. It is usually much clearer than that.

I have no further questions, Mr. Chairman.

The CHAIRMAN. One additional point that I just want to reemphasize. We have suggested that you should adopt a system of reviewing these earmarks. This is really an example of our great flexibility here. Bad as they are, they are even worse if they are not reviewed, and we might be not quite as harsh on them if they were subjected to some effort to make sure that you screen out the complete dogs and have as high a quality of program as possible here. We are quite serious about this, and we would like the Department to give us a serious response as to why they couldn't do something which is working fairly well in other Departments.

We appreciate the fact that you have a continuing decline in the number of earmarks. We think that this process might encourage a further decline, frankly, but it is part of an arsenal of things that we are suggesting in the hopes that we can move this whole system of using taxpayers' money back to a level of efficiency and effectiveness which I think the taxpayers are entitled to.

So would you be kind enough to indicate to the Secretary, or whatever you need to do, that we attach a high degree of importance to this and would really request a reasoned response as to either we would like to try something like this or we think it is impossible for X number of reasons?

Mr. VIVONA. We certainly will bring that message back.

The CHAIRMAN. All right.

And do we have any reason to harass them further?

Mr. PEARSON. No.

The CHAIRMAN. In that case we repeat our thanks to you for coming over. You have noted and we are well aware that you don't often get authorizing legislation from this committee that passes both Houses of Congress.

Mr. VIVONA. Yes.

The CHAIRMAN. Not because we don't try. We think we are making some progress, so we have fairly firm commitment from the Senators on the other side that they will be more cooperative in adopting authorizing legislation in future years. They are probably not going to be enthusiastic about using that to curtail earmarks, but who knows? The world may be changing more rapidly than we hope.

Thanks again, and the committee will be adjourned.

[Whereupon, at 10:38 a.m., the committee was adjourned.]

APPENDIX C

INSERT FOR THE RECORD
HOUSE SCIENCE, SPACE, AND TECHNOLOGY COMMITTEE
ACADEMIC EARMARKS, PART III
OCTOBER 6, 1994

PAGE NUMBER 17/LINE NUMBER 374

CATEGORY OF FY 1992 APPROPRIATIONS EARMARKS

There appeared to be some confusion during the hearing between the FY 1992 academic earmarks and the FY 1993 academic earmarks. The questions were on the 17 projects earmarked in the FY 1992 appropriations, which were all in P.L. 102-172, as amended by P.L. 102-298. The law required that the earmarks be reviewed and approved by the Secretary of Defense based on the potential contribution of the proposed projects to the national scientific and technical posture.

INSERT FOR THE RECORD
HOUSE SCIENCE, SPACE, AND TECHNOLOGY COMMITTEE
ACADEMIC EARMARKS, PART III
OCTOBER 6, 1994

PAGE NUMBER 18/LINE NUMBER 406

FY 1992 STATUTORY ACADEMIC EARMARKS

There appeared to be some confusion during the hearing between the FY 1992 academic earmarks and the FY 1993 academic earmarks. The questions were on the 17 FY 1992 statutory academic earmarks.

Proposals were requested from the 17 institutions, were reviewed, and recommendations made to the Secretary of Defense. On December 30, 1992, Secretary of Defense Cheney approved full funding for 3 projects (George Mason University, University of Texas at Austin, and the University of Wisconsin), and partial funding for Kansas State University. The Director of Defense Research and Engineering (DDR&E) was directed to notify all 14 institutions that were not approved for full funding, that the funds remained available for obligation through September 30, 1993. The DDR&E was directed to provide appropriate assistance to the institutions to formulate new proposals that could meet the statutory requirements.

A new set of individuals were assigned to the evaluation. Once a revised proposal was believed to meet the statutory requirements, the projects were recommended to the Secretary of Defense for funding.

INSERT FOR THE RECORD
HOUSE SCIENCE, SPACE, AND TECHNOLOGY COMMITTEE
ACADEMIC EARMARKS, PART III
OCTOBER 6, 1994

PAGE NUMBER 21/LINE NUMBER 468

NOTIFICATION OF FY 1992 ACADEMIC EARMARKS

On December 30, 1992 the Secretary of Defense signed a decision memorandum to approve or not approve the projects for funding. On January 8, 1993, the Director of Defense Research and Engineering (DDR&E) sent letters to the all 17 institutions informing them of the status of their proposals. Later 4 of the institutions (Brandeis University, Louisiana State University, Northeastern University, and University of Minnesota) were verbally informed that their proposals would need to be revised if they were to be considered for possible funding.

INSERT FOR THE RECORD
HOUSE SCIENCE, SPACE, AND TECHNOLOGY COMMITTEE
ACADEMIC EARMARKS, PART III
OCTOBER 6, 1994

PAGE NUMBER 23/LINE NUMBER 517

PEER REVIEW OF BOSTON UNIVERSITY PROPOSAL

The Boston University earmark was statutory, and as with all FY 1992 statutory academic earmarks did not require a peer review, rather only a decision by the Secretary of Defense. In FY 1993, however, Section 9089A of Title IX, in the FY 1993 Appropriations (P.L. 102-396) did require peer review for 8 academic earmarks. Those institutions and amounts were: John Carroll University for $5.3 million, Johns Hopkins University for $15 million, Medical College of Wisconsin for $15 million, Saint Norbert College for $3.9 million, University of Arizona for $5 million, University of Northern Iowa for $750,000, University of Saint Thomas for $15 million, and the University of Wisconsin for $15 million.

INSERT FOR THE RECORD
HOUSE SCIENCE, SPACE, AND TECHNOLOGY COMMITTEE
ACADEMIC EARMARKS, PART III
OCTOBER 6, 1994

PAGE NUMBER 24/LINE NUMBER 542

BOSTON UNIVERSITY FY 1992 APPROPRIATIONS EARMARK

The Boston University earmark was statutory. The Boston University proposal was initially found not to comply with the statutory language, was not recommended for approval, and was not approved for funding by the Secretary of Defense. The revised Boston University proposal was reviewed by researchers in the Office of Naval Research and found to be acceptable. Based on that recommendation, the Boston University proposal was approved for funding on May 24, 1993.

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HOUSE COMMITTEE ON SPACE, SCIENCE & TECHNOLOGY
ACADEMIC EARMARKS III
PAGE 36/L818

The information follows:

The DoD General Counsel has issued no special procedures for responding to congressional documents from any congressional committee.

INSERT FOR THE RECORD
HOUSE SCIENCE, SPACE, AND TECHNOLOGY COMMITTEE
ACADEMIC EARMARKS, PART III
OCTOBER 6, 1994

PAGE NUMBER 41/LINE NUMBER 924

IMPROVEMENTS TO REVISED FY 1992 UNIVERSITY EARMARK PROPOSALS

The revised FY 1992 university earmark proposals increased research of interest to DoD, and had reduced construction efforts. Specifically:

	ORIGINAL	REVISED
Research efforts of interest to DoD:	21%	44%
Non-research related efforts:	23%	19%
Construction:	56%	37%

In some of the proposals the overall goals of the project were modified to be more in line with DoD goals and scientific interests. Construction was specifically permitted by law. When construction was part of the proposal, it was tied to the scientific goals of the research.

QUESTION FOR THE RECORD
HOUSE SCIENCE, SPACE, AND TECHNOLOGY COMMITTEE
OCTOBER 6, 1994

QUESTION NUMBER 1

Academic Earmarks

Chairman Brown. The 1994 Defense Appropriations reports included $103 million in identifiable earmarks from Technology Reinvestment Accounts. The law requires that all TRP moneys be competitively awarded, merit reviewed, and include matching requirements.

a. How has/is the Department complying with the law in light of the report language earmarks in TRP?
b. Have any of the identifiable earmark projects received TRP funding in FY 1994? If so, please explain the circumstances of this decision.
c. Do you anticipate that any of these earmarked projects will be funded in future awards?

Dr. Deutch.

a. The Department has worked hard to ensure that the TRP process is widely advertised and that all awards made with TRP funds are done so competitively. The Department is on record as opposing earmarks because it eliminates the beneficial cost effects of competition and often diverts funding from high priority defense requirements to lesser efforts.
b. During the last TRP competition, none of the identifiable earmarks were selected for funding.
c. If any of the earmarked projects are funded in the future, it will be through a competitive process.

QUESTION FOR THE RECORD
HOUSE SCIENCE, SPACE, AND TECHNOLOGY COMMITTEE
ACADEMIC EARMARKS, PART III
OCTOBER 6, 1994

QUESTION NUMBER 2

"PHONE CALL" EARMARKS

Congressman Brown: Has the Department of Defense or the Services experienced "phone call" earmarks during the past three years? These earmarks are made through a Member or staffer communicating--by phone, letter or other means--that a particular account is intended to fund a location specific project that is not hinted at in law or report language. Please provide details on any incidents.

Mr. Deutch: Yes. There were numerous incidences in which the Department received phone calls and letters in support of funding for certain projects which were alleged to be earmarked for specific universities, but we did not accept these as direction which must be followed. There were so many of these events that I cannot name them all; many came in directly to the Services, and at different levels.

QUESTION FOR THE RECORD
HOUSE SCIENCE, SPACE, AND TECHNOLOGY COMMITTEE
ACADEMIC EARMARKS, PART III
OCTOBER 6, 1994

QUESTION NUMBER 3

SHAPING COMPETITIVE ANNOUNCEMENTS

Congressman Brown: During the last three years, has the Department or the Services engaged in discussions with a school regarding the shaping of a competitive announcement in an effort to give that school an edge in winning the award? Please describe any circumstances surrounding such incidents.

Mr. Deutch: I am unaware of any such incidents.

INSERT FOR THE RECORD
HOUSE COMMITTEE ON SPACE SCIENCE AND TECHNOLOGY
ACADEMIC EARMARKS III
OCTOBER 6, 1994

Question: Please explain the role of the General Counsel's Office in handling Congressional document requests in general and this Committee's requests in particular.

Answer: The Office of the General Counsel has no special procedures for handling congressional document requests from any Committee, including the House Committee on Space Science and Technology. If an Office from which documents have been requested believes that there may be legal issues involved with respect to a particular document request, it will contact the General Counsel's office. The issue will be examined and a determination will be made whether there are any legal issues involved. If there are, advice will be given on how the document request should be handled based upon whatever legal issues may impact on the Congressional document request.

INSERT FOR THE RECORD
HOUSE COMMITTEE ON SPACE SCIENCE AND TECHNOLOGY
ACADEMIC EARMARKS III
OCTOBER 6, 1994

Question: Please provide a legal opinion from counsel regarding the basis for failing to meet the December and May document requests.

Answer: Subsequent to the hearing the legal opinion that was asked for was provided to the Deputy Secretary for his use in responding to the committee request.

QUESTIONS FOR THE RECORD
HOUSE COMMITTEE ON SPACE SCIENCE & TECHNOLOGY
ACADEMIC EARMARKS III
OCTOBER 6, 1994
Q4,5

Mr. Brown: Please describe the role played by the Comptroller of the Department of Defense in handling Congressional requests for documents. When was this role assigned to the Comptroller (please provide any internal management documents that demonstrate this administrative decision). Please explain, why the Comptroller has been the point of contact for Science Committee document requests. Please explain why the Comptroller has been unresponsive to the Committee's request of May 27. Is the Department aware of any other executive agency that gives such authority and discretion to the CFO regarding wide-ranging document requests from a duly constituted Congressional Committee? Please explain the role of the General Counsel's office in handling Congressional document requests in general and this Committee's requests in particular.

Dr. Deutch: The Comptroller of the Department of Defense ensures that required and requested Department of Defense funds control documents, such as DD-1414s and DD-1415s, are provided to those Committees and Subcommittees that have been determined by the Congress to be defense oversight committees. Responsibility for these funds control documents is assigned to the Comptroller as the Department's Chief Financial Officer and chief budget officer. The Comptroller became the point of contact for the Science Committee requests that related to funds control documents due to the nature of the documents. The Department has provided that portion of the May 27 request that involves no jurisdictional disputes within the Congress. The Department is unaware of the specific roles and responsibilities regarding financial documents within other executive agencies.

The Office of the General Counsel has no special procedures for handling congressional document requests from any Committee, including the House Committee on Space Science and Technology. If an Office from which documents have been requested believes that there may be legal issues involved with respect to a particular document request, it will contact the General Counsel's office. The issue will be examined and a determination will be made whether there are any legal issues involved. If there are, advice will be given on how the document request should be handled based upon whatever legal issues may impact on the Congressional document request.

Mr. Brown: During the hearing on October 6, Mr. Deutch promised to seek information both on why documents requested by this Committee had been withheld and what legal basis the Department may have for refusing to cooperate with Congressional requests for documents. Please provide details regarding the Department's handling of the Committee's December 1993, May 1994, and July 1994 requests. Please provide a legal opinion from counsel regarding the basis for failing to meet the December and May document requests and detailing guidance on how the Department will act to comply with any future requests by this Committee for similar documentation.

Dr. Deutch: The Department conforms to the requirements of congressional oversight by providing budget material and copies of funds control documents to those committees defined in annual defense authorization bills as cognizant congressional defense oversight committees. The Department did provide some program information directly to the Science and Technology Committee, but, as questions of jurisdiction are a legislative prerogative, sent requested copies of the funds control documents to the office of the Speaker of the House for further disposition to interested committees.

Subsequent to the hearing the legal opinion that was asked for was provided to the Deputy Secretary for his use in responding to the committee request.

DAN PEARSON

OSD - LEGISLATIVE AFFAIRS **DOCUMENT CONTROL RECORD**	CLASSIFICATION UNCLAS	INCOMING CONTROL NO	OSD-LA CONTROL NO. U-94-165 (Orig)

SUMMARY OF BASIC DOCUMENT *(Source, file number, subject (or short title if subject classified), date, number of copies, pages. List and identify inclosures seperately.)*

DATE RECEIVED

Transcript + QFRs (5)
6 Oct 94
HSS&T
SUBJ: Academic Earmarks, Part III
WITS: Hon. John Deutch, Dep Sec of Def; ACCOMP BY: Anita Jones, Dir., Defense Research and Engineering
PAGES: 1-73
TIME: 9:02-10:38

~~POL~~ (USD(A&T)) is OPR for this transcript. Include ALL edits and inserts required. CLEAR ALL thru OSD SecRev - 2C757 - BEFORE returning to OSD(LA) - 3D932 - Connie Wachsmuth - x57800

NOTE: Transcript went directly to DOE. Shirley Watson w/Cmte did not send DoD a copy, until today Nov 7, 94.

CMTE SUS: 1 Nov 94

DATE	TO	FOR*	DESCRIPTION *(Copy No., Incl)*	SIGNATURE
8 Nov	~~POL~~ Acq	A	Transcript + QFRs	
1 Feb 95	HSS&T	T	Transcript, + 3QFRs	
	822 ~~O'Neill House Office Bldg~~			
	ATTN: ~~Shirley Watson~~		Dan Pearson	
	2320 RHOB			
24 Feb	HSS&T	T	QFRs (2) & IFRs	
	2320 RHOB			
	ATTN: Dan Pearson			

*CODE. A - Action
D - Disposition
R - Routing
C - Coordination
DC - Destruction, Certificate of
T - Transfer
CF - Central Files
F - Office File
Z - Other *(Specify)*
CR - Cross Reference
I - Information

SD FORM 1 MAY 431

The CHAIRMAN The committee will come to order.

We understand, Dr. Deutch, that you have another urgent matter to help make the Congress happy this morning, and we are going to try and move as quickly as possible to get to that

Mr DEUTCH I'm a little bit better off with time, sir.

The CHAIRMAN. We will proceed then.

This hearing is the third day of hearing that we have had recently on academic earmarks, and this morning we are going to hear from Dr Deutch from the Department of Defense and from Mr. Vivona, the chief financial officer at the Department of Energy, to discuss the situation in these two Departments

Let me say briefly before recognizing you for your testimony, Dr Deutch, that this is not intended to be an adversarial hearing, this is a friendly hearing, but we do recognize that you are caught in the middle between a couple of conflicting forces in the Congress, and we use these hearings to establish rather clearly what is happening with regard to earmarks and also to establish what we consider to be the philosophical, legal, moral, and other bases for what we are doing in connection with this situation

The situation with regard to earmarks as we see it is an abrogation of the principles on which this country was founded and a violation of the rules of the Congress. It is also undesirable to the administration and violates many of the practices which the administration has put in place. We say that because under our constitutional system of laws it is intended that the Congress be a democratic body and that its powers be exercised in a fashion based upon the rule of law and not on the rule of personalities.

It seems apparent to us that the processing of earmarking by a relatively few senior Members of one committee of the Congress violates this principle, and that is, when you get right down to it, there is no equity or justice or any other fundamental principle except the principle of applying brute power. You have got the power to do something, and you do it, and you yield to that out of a historical necessity to get along and under the pressure of threats that if you don't, you may be punished in subsequent appropriations cycles. That is a principle that Thucydides explained 2,500 years ago on the way the Greeks operated it during the Peloponnesian War when the Athenians fighting Sparta sought to enlist all the neutral city states in their camp, and in a confrontation with one neutral state, as reported by Thucydides, the Athenian says the strong take what they can and the weak yield what they must. In your confrontation with the Appropriations Committee, you feel that you are weak and you yield what you must.

Many Members of Congress take the same point of view, that in the confrontation with the Appropriations Committee we have to let them have their way because we will be subsequently punished by one form or another of deprivation of taxpayers funds. That whole process is basically immoral and runs contrary to the principles on which this country is founded. We do not intend to stop trying to discontinue that sort of thing. You get caught in the middle of this, and you try to adjust because you don't know who is going to win this fight basically, and you want to be on the winning side, and we understand that.

But I think it is important to have on the record that, assuming that I continue to be reelected, the fight will continue and that it will take many forms, including the securing of the necessary documents from your Department, publicity, hearings, the use of the media in every way possible, the changing of the House rules, and any other steps necessary in order to make the system work in the way it was intended to work both to protect the questions of quality in the way we operate, improve the, in your case, the defense capabilities of the country through the proper expenditure of funds, and basically establish a situation in which all Members of Congress have some degree of equality in establishing what the will of Congress is.

You and others repeatedly refer to your efforts to do the will of Congress when what you mean is you are trying to do the will of a few Members of the Appropriations Committee reflected in nonlegal ways basically, report language, and frequently not even that but in letter or oral communication from Members. That is not the will of Congress, that is the will of a few Members of Congress who are seeking to convince you that they reflect the will of Congress, which they may or may not do.

Now this is just by way of background so that you will understand the nature of the situation that you are in, and we wish you the very best in extricating yourself from it.

But let me add one final thing. With regard to our request for documents from the Department, you repeatedly referred to your willingness to provide documents to the committees having oversight. It is not your role as the Department of Defense to determine which committees have oversight, that will be determined by the Congress and by whatever other instrumentalities are necessary.

We are acting on legal advice that we have jurisdiction over the matters that we request, and I have told you before, and I will merely repeat it here, that in the event you disagree with us we will resolve that through the normal fashion, we will go to the Floor of the House and determine whether we have it, and you may report that to your cognizant committees if you wish.

Now you may proceed with your testimony.

(09) STATEMENT OF HON. JOHN DEUTCH, DEPUTY SECRETARY OF DEFENSE, U.S. DEPARTMENT OF DEFENSE, WASHINGTON, D.C., ACCOMPANIED BY ANITA JONES, DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

Mr. DEUTCH. Thank you, Mr. Chairman. I first of all want to tell you how pleased I am to appear here before the committee.

The CHAIRMAN. Don't lie, John, just give us the facts.

Mr. DEUTCH. You know that ~~I~~ 20 years ago I used to spend an enormous amount of time before this committee, and in fact I am pleased to get back.

The CHAIRMAN. My respect for you goes back the full 20 years.

Mr. DEUTCH. If I could, I would like to submit my prepared testimony for the record, and I would like to make a few remarks which go, I think, more directly to the heart of the subjects that you are raising, Mr. Chairman.

First of all, I want to start by saying that I don't have to tell this committee how important research and technology is for the Department of Defense, that it supports both the short and long-term military capability of the Nation. Technology gives our troops military dominance that, as Desert Storm indicates, leads us to more rapid victories with fewer casualties.

Mr. Chairman, I am accompanied today by Anita Jones, the director of defense research and engineering. Yesterday Anita Jones presented a new strategy for support of technology base activities in the Department. It is a wise and thorough document which lays out how we are trying to run our technology programs to meet the changed circumstances of the world.

We believe that military technology is still moving rapidly and continues to be important for national security. Examples are stealth, precision strike, and modeling and simulation, and we are also cognizant that the programs of the Department of Defense, especially its basic research programs, and where universities are performers of that research program, that there are major contributions made to the long-term Nation's strength both in technology and education. The contributions the Department has made over time to computers, to electronics, and communications needs no elaboration here; it is just very apparent that the science and technology base of the country is in large measure due to the efforts of the Department of Defense.

What is our position on earmarks? Simply put, the Department of Defense opposes congressional earmarks that send research and development money to a designated recipient without passing through some executive branch or other review process, and it is this latter point which I think goes to your point, Mr. Chairman, about the democratic process. Our view is a procedural one, that earmarks circumvent some sort of a review process and that, in general, we believe that as a result there is a less efficient allocation of public money and that in a time of declining research and development dollars the diversion of these funds to earmarked projects is even more serious.

Now the trend in the earmarks in the Department of Defense budget has been climbing, but we believe that it is down significantly in ~~fiscal in~~ the fiscal year 1995 budget, so at least in that regard the trend is in the last direction.

Why has there been this increase in earmarks? We believe that one of the reasons there has been an increase in earmarks has been the reluctance of past administrations to work with Congress to define technology investment properly for the country, that, for example, in dual-use technologies that Congress was seeking to have a way of working with the executive branch to design investment programs that were broader for the Nation's purpose and the reluctance of prior administrations to consider those investment programs has been one of the reasons that earmarks have grown.

What I would like to do is to briefly ~~say~~ offer advice, what can Congress do and then what ~~should~~ the executive branch should do.

I believe that earmarks are basically a congressional problem, Mr. Chairman, I don't believe that they are basically an executive branch problem. Congress has the authority under law to direct spending in executive branch agencies. If Congress wants to spend money on performers or locations of direct interest to Members, they have the legal authority to do so. The method currently in use to earmark language in committee reports and to refer obliquely to designated recipients is not a straightforward matter to manage, as you noted. I don't believe, sir, that we accept direction ~~by~~ orally or through letter, but when there is language, report language, or where there is oblique reference in either authorization or appropriations bills, we certainly do try to attend to the congressional intent. nor is the practice sometimes used, where there are more earmarks than funds available, easy to manage, so that choices are left to the executive branch agencies to make decisions among programs that have had interest specified in conference reports.

There is one point which I would like to take a slightly different view on, and that is, I frequently hear that the Appropriations Committees are the ones responsible for earmarks. This is not my impression, sir, this is not my impression. The moving force for earmarks are Members from the entire body of Congress who would like to do something for their districts. The Members who call me about earmarks and advocate their funding are not usually from the Appropriations Committee but they are those Members who have convinced ~~convinced~~ either the authorizers or the appropriators to put a specific reference either obliquely or directly into their bill. The Appropriations Committees, in fact, usually leave language that permit us the flexibility to make the final decision.

The good news is that the earmark is rarely absolute, the bad news is that it places us in a very difficult position as an executive branch official to make a choice about what congressional intent is ~~but~~ again I want to emphasize that the earmarks are always in congressional language, they are not separately communicated outside of the bill. In ~~these cases, in~~ all these cases, we are accountable for managing the public's monies for the public's general good purpose. We are therefore put at odds with individual Members of Congress whose interests are in the direct welfare of their districts.

Let me next turn, Mr. Chairman, to what I believe the executive branch can do. The first is that we have to assure that all of our research programs and grants are awarded on the basis of competition. We do not and should not permit indefinite renewal of past rewards. This gives potential new R&D performers the impression that they have

[The statement of Mr. Deutch follows:]

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an opportunity to participate in the research programs of the Department, and we are strong advocates of requiring competition for the research programs that we have.

Secondly, we believe that it is important for the executive branch, the Department of Defense, to work with Congress to establish programs that are needed, investment programs, whether that is facility construction, establishment of new centers at colleges and universities that are attempting to strengthen their research and education programs, or establishing centers that are for particular subject matter areas, that if we, with Congress, establish new investment programs and restrict competition in these new investment programs to institutions that qualify, we will offer a practical alternative to the major impetus for earmarking. This means that the Department of Defense will allocate a portion of their R&D program to new program areas that meet a broader range of needs than are the normal case in our research programs.

Finally, Mr. Chairman, let me say that we do work directly with interested Members to make sure that we find the most effective way to invest the public monies that we are responsible for, and, as you point out, it does place us in a very difficult position.

Let me stop there, sir, and answer any questions or go into any of these matters that you may wish.

The CHAIRMAN. Thank you very much, Dr. Deutch. We do appreciate your sage advice, and you have correctly described the situation.

The point you make about earmarks coming from sources other than the Appropriations Committee and benefiting other than the Appropriations Committee is sound. We, in our effort to make the point we are making sometimes, present it in slightly more stark terms than you may feel is justified.

We are well aware that a large number of the Members of the Appropriations Committee as to earmarks, and including the chairman, seek to reduce them or eliminate them insofar as possible. Previous chairmen like our late Congressman Natcher was violently opposed to earmarks and kept them out of the bills that he was involved in.

We also know that many Members who are not on the Appropriations Committee plead with appropriators to include earmarks for their purposes in the bill, and I made some reference to this begging process that goes on It is not an effort to achieve equity, it is an effort to get votes for the final bill, to spread around some of these earmarks, and that makes it no less undesirable because it operates in that way.

Many, as you pointed out, nonappropriators follow the practice of earmarking on authorizing bills. As long as it is contained in legislation, however, there is a process by which the Congress can exert control, by amending the language on the Floor, and that is frequently done. When it is contained in report language or other informal and nonbinding places in the process, it is not amenable to the consideration of the full Congress, and hence it is doubly noxious because of that.

Now with regard to the equity of this whole matter, our contention has been, and it is amply documented by the record that we have achieved, that about 90 percent of all the earmarks goes to about a dozen people or the districts represented by about a dozen people. In the case of defense earmarks, we have a chart here--and I'll put it in the record--that in 1994--these are defense academic earmarks; there are nonacademic earmarks which frankly we don't pay too much attention to, we leave that entirely to you, but we feel that the quality of academic research is badly defective when it is not subject to some quality control, and it is our jurisdiction to see that that kind of control is exerted.

For all defense academic earmarks in fiscal year 1994 which amounted to $281 million, $144 million, slightly over half, went to the State of Pennsylvania, and $114 million, about 40 percent, I guess, went to the 12th Congressional District of Pennsylvania. For 1993 the figures were $275 million for all academic earmarks. Pennsylvania received

$58 million and the 12th Congressional District $33 million. Again, these are very substantial percentages of the total academic aarmark.

For 1991 it was $129 million, $47 million--$48 million approximately went to Pennsylvania, and 12--$13 million went to the 12th Congressional District.

Now if you can sense from that any degree of equity or distribution around the country, you have a much finer perception than I do, and I will have this inserted in the record.

[The information follows:]

******** COMMITTEE INSERT ******** to come?

The CHAIRMAN. Now, I am going to recognize Mr. Becerra if he is ready to participate in this enlightened discussion.

Mr. BECERRA. Thank you, Mr. Chairman.

Mr. Deutch, thank you very much for being here. I appreciate it, and I would like to associate myself with everything the chairman has said with regard to earmarks. I most strongly want to emphasize that I think the comment made that this is an issue to be dealt with by Congress is perhaps the most appropriate. It seems to me that the executive branch is caught in the middle and--but you are the folks that we can bring to testify, so I think that is why you are here.

Let me ask you a few questions about the 1992 appropriation earmark that apparently in most cases, I believe, of the 17, only 4 or 5 were actually found in compliance with the criteria to be funded by the Department of Defense, and subsequently by 1994, I believe the spring of 1994, after some assistance from the Department to the grant seekers, all of the 17 earmarked projects were funded.

Can you give me some indication of what happened between 1992 when most of the programs were not funded and in 1994 when Department of Defense changed its position and funded the programs?

Mr. DEUTCH. Well, I believe that if I recollect the set of academic--these are academic construction?

Mr. BECERRA. Yes.

Mr. DEUTCH. Were they in the bill or in bill language, do you remember?

Mr. BECERRA. Some in the bill, some in language, some not.

Mr. DEUTCH. Right. Well, ~~they were~~ as I recall, there are two categories, two different sections of the bill ~~where~~ they were involved in, and I would have to go back and provide you for the record exactly which category applied. What we did was, we looked at the conditions that Congress asked us to apply before we granted the money. We worked with the institutions ~~proposing~~ to make sure that they had a proposal that conformed to the requirements under the Act and then made the decision to fund them.

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Mr. BECERRA. Let me stop you now. The original decision was not to fund. At least, of the 17, I think 12 were not funded.

Mr. DEUTCH. But as I recall, this is a set of earmarks which were--there was a change in the management of the Department from Secretary Cheney to Secretary Aspin. So I think we looked at this set afresh when we came in and asked whether ~~there was--whether~~ they satisfied the two or three, as I recall, purposes that--that the Act said we had to match for them.

Mr. BECERRA. Let me follow up on what you just said. There was a change of management. Did the folks who reviewed those earmarks initially change with the incoming--

Mr. DEUTCH. No. No.

Mr. BECERRA. Okay. So the people that issued the first decision to fund or not fund the 17 earmarks did not change.

Mr. DEUTCH. The evaluators did not change.

Mr. BECERRA. The what?

Mr. DEUTCH. The individuals who did the evaluations of the several different proposals did not change.

Mr. BECERRA. So what change that caused--within management that caused a rereview of the earmarks?

Mr. DEUTCH. I suspect that it was a decision that I made when I was undersecretary of defense for Acquisition. I would have to go back and really find out the specific set to know whether it is the one that I have in my mind, the one that you are referring to.

We looked at that set of earmarks, and we decided that ~~what we would do is;~~ we would work with each one of those individual institutions to assure that they qualified under the language of the committee report. ~~and~~ then we decided to grant them.

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Mr. BECERRA. Is that something you would normally do with~~--~~?

Mr. DEUTCH. Yes.

Mr. BECERRA. Any grantee?

Mr. DEUTCH. No. It is something that we would normally do when we were acting under congressional direction to give the grants--I mean the contracts--the grants in this case.

Let me remind you, what we are told to do is to give the contract, and it is of course money which has to be spent in that way because it has congressional interest on it, and therefore we have the choice of either saying that it hasn't conformed~~, and~~ we have done that in several cases, but I don't think in the particular set, the fiscal year 1992 earmark set--

Mr. BECERRA. Now when you say you were told by Congress to do this, to fund or to earmark the funds in certain ways, you are not saying in all cases it was statutory language, you are saying in some fashion you got word from Congress, and here I assume you mean some Members of Congress.

Mr. DEUTCH. No. No. Let me make it quite clear. It comes in three ways. One is as statutory language; secondly, as committee language where a specific recipient is designated and congressional interest~~--congressional interest~~ is indicated, which means that the money cannot be spent for any other purpose; and, third, with more ambigu~~ous,~~ity--the third way it happens, in committee report--in committee report language where also congressional interest is more obliquely--I'm sorry, the purpose, the recipient is more obliquely referred to, and then congressional interest is indicated, and we are not able to spend the money unless we spend it on that purpose. Those are the three different ways. But there should be no impression that there is no external communication about recipients by letter or by voice outside of what is defined by the congressional reporting lenguage.

㉑ Mr. BECERRA. So let's take whatever was written either in statute or report language. As I understand it, each one of these projects had to undergo a review process.

Mr. DEUTCH. If the category that I recall--yes, that is correct.

Mr. BECERRA. I think all 17 had to undergo a review process, and it had to meet certain criteria that were set out. It was very general, I will admit to that.

Mr. DEUTCH. Thet is correct.

Mr. BECERRA. And that was done.

Mr. DEUTCH. Yes.

Mr. BECERRA. And of the 17, four or five were granted funding, the others were rejected because they had not met the review process.

Mr. DEUTCH. I don't think they were rejected. No action was taken on them, as I recall, because they had not met the review process.

Mr. BECERRA. When you say no action was taken, what does that mean?

that ~~mean~~?

Mr. DEUTCH. Just what it says. There was no letter sent out accepting or rejecting the proposal.

Mr. BECERRA. Are you saying that there was nothing either explicitly stated in writing or orally that those projects were being denied?

Mr. DEUTCH. That is my recollection, sir. I would have to check to be sure. That is my recollection.

Mr. BECERRA. All right.

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Mr. DEUTCH. Let me step back here for a moment, sir, if I may.

Is it all right, Mr. Chairman?

The CHAIRMAN. It certainly is.

Mr. DEUTCH. You know, I used to run a big university, a very big university, and we were great advocates of absolutely hands-off evaluation because we knew we had every advantage in terms of our intellectual and ~~physical~~ fiscal capital to perform research well and properly for the public good, and we ~~are~~ were very proud of our record. But many of the institutions we are talking about here are struggling institutions from one part of the country or the other, and they see themselves and their representatives, their Congressmen and their Senators, see them ~~themselves~~ as having a need to have some opportunity ~~and~~. So while it is easy to paint the picture of somebody who is, especially a small college or university, trying to do something which is immoral or ~~trying to do something which is~~ unethical, what they are really trying to do is to learn how to benefit themselves ~~for their benefits~~ and their district. ~~and~~ So when we worked with some of these smaller places to put together a proposal, I don't think ~~it should be in~~ all aspects of it should be regarded as just being a black outcome, a dark outcome.

(2) Mr. BECERRA. And I think I agree with what you said. I don't think that anyone here believes that what we do in trying to fund some of these projects is just waste money.

Mr. DEUTCH. It is the process that is wrong, sir.

Mr. BECERRA. And I agree with you there.

Can you--I know we have had a chance to review some of the documents you have provided--and, by the way, thank you very much for doing so--but it seems to me that having reviewed the initial proposal submitted by some of these applicants for the earmarked dollars and the subsequent revisions that were made by these applicants after having heard that they were not receiving the funds initially, that very little if no change had occurred between the proposals, yet the process somehow went from a rejection to an approved funding of the program, and the one that sticks out most in my mind is Boston University.

(5) Mr. DEUTCH. Well, I don't remember the Boston University.

The CHAIRMAN. I think this refers to the photonics lab.

Mr. DEUTCH. The photonics lab. I don't remember the details of, but coming from Boston myself, I understand the problem. I don't know exactly. I'll have to go back and refresh myself on the photonics lab and how it was done.

Was that in the report language, or was that in the actual legislation?

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Mr. BECERRA. In the statutory language.

Mr. DEUTCH. Sorry?

Mr. BECERRA. Statutory language.

Mr. DEUTCH. Statutory language. Well, if it was statutory language, as the chairman has noted, we have less ability to work with the problem, because the photonics was statutory language, wasn't it?

Mr. BECERRA. Well, but it is statutory language that requires a peer review process.

Mr. DEUTCH. Yes.

The CHAIRMAN. And Boston University is one of those small deprived colleges. It only ranks up in the--

Mr. DEUTCH. I'm going to say something that I shouldn't say, and that is ~~that~~ my own personal sympathy with Boston University in this matter is much less than other institutions.

Mrs. MORELLA. But that's my alma mater.

[Laughter.]

Mr. DEUTCH. Well, be that as it may.

Mr. BECERRA. You could change the review process and perhaps come up with a different decision.

Mr. DEUTCH. Well, I will go back and read what the Boston University photonics language was in statute on this, but I'm sure it was designated as a matter of congressional interest, and refresh my memory on it.

to whom? Insert

Mr. BECERRA. Let me ask you some of the things you mention in your written testimony. I know that there were some discussions earlier that this committee has had with the Department in attempts to receive documents requested, and I know the Department took the position that certain documents would be released only to the appropriating committee and the committee with immediate oversight over the issue at hand, and I know that some documents were released, quite a few documents were released to this committee, which was not perceived by the Department to have direct oversight or appropriation authority over the Department of Defense.

You mention that in your statement, written statement, on page 4 in that top paragraph: "The Department believes that further distribution of these fund documents to other committees and Members is entirely the prerogative of the recipient committees and congressional leadership."

㉑ Can you give me some citation of authority for that particular statement?

Mr. DEUTCH. I cannot. I am not an attorney, mercifully. I am not an authority on congressional procedure.

I will say that I do feel extremely caught in the middle on this subject and I would always follow the direction of the Congress or the direction of the leadership on Congress on this matter, and I have actually tried to resolve it. But this really is a situation where I am directly caught between the views of various committees, and I suggest here again that this is a congressional matter, not one that has to do with the executive branch.

The CHAIRMAN. Would the gentleman yield to me briefly on that?

Mr. BECERRA. Of course.

The CHAIRMAN. I fail to see how you were caught in the middle of anything, Dr. Deutch. We made a request. It is backed up by legal opinion, which I will put in the record at this point, indicating that we do have jurisdiction.

[The opinion follows:]

******** COMMITTEE INSERT ********

Where/?

The CHAIRMAN. Now what instruction did you receive that we didn't have jurisdiction or that we shouldn't get the documents?

Mr. DEUTCH. The advice on which I was acting, sir, was that the normal practice is for us to provide this information to our authorizing and appropriating committees and that the mechanism for having that transfer to other people take place is through them. That is my understanding of the situation. If I am wrong about that, Mr. Chairman,--

The CHAIRMAN. Did you receive advice or counsel from a member of the Appropriations Committee or the staff of the Appropriations Committee that you should not provide those documents?

Mr. DEUTCH. No, I did not.

The CHAIRMAN. Do you know of anyone who may have received that?

Mr. DEUTCH. I don't know of anybody who may have received that.

The CHAIRMAN. It is just your intuition that they would not want us to have it?

Mr. DEUTCH. No. No. Excuse me, sir. I received advice from my comptroller on the subject.

The CHAIRMAN. And do you know on what basis your comptroller made that kind of unheard of and unjustified opinion to you?

Mr. DEUTCH. No, but I will be glad to inquire of him and provide an answer for the record.

We did spend a lot of time thinking about this and what was the right way to do it. But I must say, sir--

The CHAIRMAN. I must say, Mr. Deutch, if you were guided in your decision by anyone from the Appropriations Committee you are in deep do-do.

Mr. DEUTCH. Well, ~~I did not speak,~~ as I said ~~to you,~~ and I repeat unequivocally, I certainly did not speak to any member of the Appropriations Committee or the staff of the Appropriations Committee on this issue. I did also try, Mr. Chairman, to ~~try and~~ find others, leadership, ~~which,~~ who would give me some guidence on this and did not get it resolved.

Mr. BECERRA. Mr. Chairman, let me continue with that line of questioning.

Dr. Deutch, you are saying you spoke to the comptroller with regard to the release on documents to this committee and it was only the comptroller you spoke to for guidance on this?

Mr. DEUTCH. I think that is right, yes. In my Department, that is right.

Mr. BECERRA. By the way, what is the name of the comptroller?

Mr. DEUTCH. John Hamre. I think this is reflected in some of the correspondence with the committee.

21 Mr. BECERRA. It is.

The CHAIRMAN. Our information indicates the comptroller is not a lawyer, did not seek any legal advice, and may have been guided by some informal advice he may have received from other sources. Would you mind checking on that, too?

Mr. DEUTCH. I would be delighted to do so, and I ~~don't mean to conceal from you my--I~~ would also guess, although I don't know for sure that he did speak to the appropriators about it. I don't want to pretend that that is not the case. But I will find out and let you know, sir.

[The information follows:]

******** COMMITTEE INSERT ? ********

㉑ The CHAIRMAN. Mr. Deutch, this may be the most flagrant and egregious case of where you have taken it upon yourself to adjudicate a problem which is a congressional problem. Your duty is to respond to legitimate congressional requests. This was a legitimate congressional request. You chose not to respond to it on an inadequate basis, in our opinion, and if you can get a better opinion we would be glad to put it in the record. But that is a very serious situation.

Proceed.

Mr. BECERRA. Thank you, Mr. Chairman.

Dr. Deutch, let me see if I can get a better sense of this. When you received the request from this committee to release documents, whom did you consult with in the Department on any action to be taken by the committee?

Mr. DEUTCH. My comptroller.

Mr. BECERRA. The comptroller.

Mr. DEUTCH. Yes, sir.

Mr. BECERRA. Anyone else?

Mr. DEUTCH. No. I think that is the only person.

Mr. BECERRA. So—

Mr. DEUTCH. I don't recollect speaking to anybody else about it. This ~~is~~ was some time ago now and—

Mr. BECERRA. Your best recollection.

Mr. DEUTCH. I ~~think I actually~~ If I'm not mistaken, I ma have also spoken to the chairman of this committee about it. Yes, I do recall calling the chairman of the committee about it. Yes.

The CHAIRMAN. The chairman expressed great sympathy for your situation.

Mr. DEUTCH. I'm sorry, sir?

The CHAIRMAN. The chairman expressed great sympathy for your situation.

Mr. DEUTCH. That is what I recollect.

Mr. BECERRA. Let me continue then. So according to your best recollection, the only individuals that you spoke to would include the chairman of this committee and the comptroller of the Department of Defense?

Mr. DEUTCH. That is all I recollect.

Mr. BECERRA. Okay.

Any reason to believe your recollection would get any better than it is today?

Mr. DEUTCH. Yes, there is. I mean I just haven't thought about the sequence of people with whom I spoke to about it.

Mr. BECERRA. Would there be documents that would help refresh your memory?

Mr. DEUTCH. No. No, there are no documents, I'm sure.

Mr. BECERRA. Okay. What would help refresh your recollection?

Mr. DEUTCH. Talking to my comptroller.

Mr. BECERRA. Okay. And the best you recall, what was the advice that you received at the time that you first approached the comptroller?

Mr. DEUTCH. Let Congress work it out.

Mr. BECERRA. Which meant what to you?

Mr. DEUTCH. That there were different views among the committees, both explicit and implicit, and that this was a matter between titans in Congress and that we should wait till Congress had worked it out. I still think that that is very good advice.

Mr. BECERRA. And you are under a legal obligation to respond to a request of a committee?

Mr. DEUTCH. Well, of course, I will respond under any legal obligation.

Mr. BECERRA. Do you believe that as you sit here today you are under a legal obligation to respond?

Mr. DEUTCH. I don't have any competence to ~~make an~~ answer ~~to~~ that question ~~statement~~.

Mr. BECERRA. Well, based on the level of competance that you have as the Dep ~~under~~ secretary of defense, do you believe--or it is actually no longer the under secretary; I apologize--the deputy secretary of defense. Is it your belief that you have an obligation to respond to a request from this committee?

Rec.

Mr. DEUTCH. No, I think, sir, quite the contrary, I think you are under an obligation to decide what I have to do. I think it is up to Congress here, not up to me. I think that it is really quite unfortunate that--~~that~~ I don't have a clear recollection on this, and ~~so my view on this~~ I don't want to express it too harshly--~~is~~ as the chairman has said, we are caught in the middle. We try ~~and~~ to do the best we can, but that is no way to run a business--I mean run a Government. I try ~~and~~ to do the best I can and I have committed myself. As the chairman correctly notes, I am obligated and have stated ~~both~~ in every possible way, I try and I think I have the reputation of cooperating with Congress, but here Congress is divided, Congress is divided on how to conduct itself, and we need to have clear direction.

The CHAIRMAN. Would the gentleman yield to me again?

Mr. BECERRA. Of course.

The CHAIRMAN. Mr. Deutch, that statement just doesn't ring with me. You received a legally supported request for documents, and you say you were caught in the middle. The middle of what? You said no one told you not to provide those documents.

Mr. DEUTCH. Mr. Chairman, I'm going to have to ~~do some more~~ go back and talk with my counsel on this, but my own view is that there ~~were~~ was a view that the obligation we had was to provide the documents, the particular category of documents, to our authorizing and appropriating committees, which we were perfectly willing and had done. In fact, as I understand it, our documents were present in Congress. It isn't as if we were withholding them from Congress. They were present with our authorizers and appropriators.

The CHAIRMAN. Well, Mr. Deutch, your actions have tended to circumvent the normal ways in which the Congress expresses itself. The normal way is for a committee which has legal jurisdiction to make a written request for documents within their jurisdiction and you respond to it.

Now you tell us, based upon no legal advice or no consultation with any other Members of Congress, that you couldn't do that. Now that is just completely un--it is difficult for me to understand how you could do that. Now if you came to me and said Mr. Murtha told you not to give them, then I could understand, but you had no communication with Mr. Murtha or anyone else. Your comptroller is not an attorney, he is a former employee of Senator Nunn, who happens to agree with us on this.

Now I want you to go back and find out just where the conflict arose. How did you happen to be forced into a position to declining a legal request from this committee?

Mr. DEUTCH. Sir, it was my impression, perhaps an incorrect impression, that because we had provided these documents to our authorizing committee and our appropriating committee, that the normal path--

The CHAIRMAN. Well.

Mr. DEUTCH. I will go back and check on it, Mr. Chairman.

The CHAIRMAN. Yes. You find out if you have a history going back to never providing documents in response to a request from any other committee.

Mr. DEUTCH. Yes, sir.

The CHAIRMAN. And any legal opinions that you are not allowed to provide documents to any other committees.

~~[The information follows:]~~ ~~[illegible] QFR #5~~

~~********* COMMITTEE INSERT ********~~

9

(2) The CHAIRMAN. Now you are making a point of the fact that these committees are your committees of jurisdiction, Appropriations and Armed Services. They are not the committees of jurisdiction. Jurisdiction over your Department resides within the rules of the House, and it clearly specifies--and I'll cite--we will put the citation in the record--that on those matters involving nonmilitary research, which includes the university research initiatives, the manufacturing technology program, the experimental evaluation of major innovative technologies, and the technology reinvestment program, this committee has legislative jurisdiction and oversight jurisdiction.

Now you go back and get an opinion to refute that if you can.

Mr. DEUTCH. Yes, sir.

Mr. BECERRA. Actually, Mr. Chairman, I would like to request that Dr. Deutch do us a couple of favors.

Do we have anything in the record--and I'm not sure of this, Mr. Chairman--that indicates what the opinion of--I guess the opinion of the comptroller is in regards to the release of documents?

Dr. Deutch, do you know if we received something from the comptroller expressing this opinion?

Mr. DEUTCH. I'm you sure have not, but I will make sure we get you something on that.

Mr. BECERRA. Will you be willing to provide this committee with an opinion from counsel from the Department of Defense as to the propriety of withholding documents requested by this committee as well?

Mr. DEUTCH. If you wish, that is fine.

Mr. BECERRA. Okay. And we can be more specific with the--the committee can submit a more specific request to you to make sure it is clear what is being requested in the opinion, but it seems to me it would be good to have in our hands an opinion from an authority, a legal authority from the Department of Defense, as to reasons for withholding documents requested by the committee.

~~[The information follows:]~~ Same as QFR #5

******** COMMITTEE INSERT ********

Mr. BECERRA. Let me go back, and, Mr. Chairman, I know I'm taking more time than--

The CHAIRMAN. Let me just interject on that point, we have still not received a number of documents that we requested by letter some time ago. As long as you are having your counsel review the legality of such request, have him include those that you haven't provided, and if you can't find a good legal reason to withhold them, I suggest that you provide them.

Mr. DEUTCH. We did provide the two documents--

The CHAIRMAN. You did, and we agreed that that was adequate for the time being, but that does not by any means invalidate the continuing request.

Mr. DEUTCH. Yes.

Mr. BECERRA. And I want to make sure my request is clear, and I hope it is the request of the committee, and that is that we receive a legal opinion from counsel from the Department of Defense, legal counsel, which addresses directly the issue of the Department's authority to withhold documents requested by this particular committee.

Let me--and I see that my colleague from California has arrived, so I will ask only one last question and yield time.

You mention in your written testimony on page 2, one of your last paragraphs, "I am not claiming that DOD decisions should be considered infallible or held inviolate," et cetera, et cetera. "Our dollars, our time, and our effort are carefully allocated for the maximum return based on the principles of competition and peer and merit review. Disruption of this plan through diversion of dollars, staff, or time carries a price. Therefore, our program research earmarks, no matter how well intentioned or seemingly meritorious, must meet a very high standard."

I'm puzzled because those 17 earmarks from 1992, most of them were rejected, and you are telling me that there was a change in management that occurred.

Mr. DEUTCH. Change in administration, yes.

Mr. BECERRA. Okay, change in administration, but no change in the evaluators of those 17 earmarked projects.

Mr. DEUTCH. Yes, sir. What happened was, again, if I recall the set we are talking about, that there were a set of conditions that had to be met before the grants ~~sh~~could be awarded; that the decision was made to work with those institutions and their proposals. In that process, they got considerably better ~~and were judged to~~ before they were granted, and it actually took quite a period of time for some of them to meet the criteria, and then the decision was made.

~~So--and here we enter~~ just let me refer back to my remark that there were a wide range of institutions, and some of them will undoubtedly be stronger as a result of it.

Mr. BECERRA. When--I want to key on the words "considerably better." Will you do me the favor--and I apologize that we have you sitting here when perhaps we should have others sitting here answering the more direct questions about earmarks, but would you do me a favor, since it was the Department of Defense that did make the decisions to allocate the fund for these earmarked programs--can you tell me on those 14 or 15 programs that were subsequently approved for funding that were initially rejected, can you specify how they were changed to make them considerably better from the first to the second?

Mr. DEUTCH. Yes, I can, because ~~I mean~~, first of all, let me make it clear--

Mr. BECERRA. Actually, I would like that in writing. I don't wish you to go through all 12 or 13 or 14 at this stage. I know you have to leave.

Mr. DEUTCH. No, no, I do not have to leave. This is important to me. I'll tell you, I'm going to say something I was responsible for the decision, there is no question about that, and I think we can quite well document, if--again, if I have the right set in my mind--that the proposals became much stronger, and we will be happy to do that.

But I want to step back for a moment, and I'm running the risk of doing something you are not supposed to do which is losing one's focus--I am against academic earmarks. Let me make it clear that I am against academic earmarks. Where they are happening is up here, they are not happening down with me, and you are putting on me the onus of all of these problems when they are happening up here.

Mr. BECERRA. Absolutely correct.

Mr. DEUTCH. With Members of the entire Congress, not just the Appropriations Committee.

Mr. BECERRA. Absolutely correct, and at some point--and I will say this as an individual Member of Congress--at some point those chairs should be filled not by folks from the administration, not from folks from the universities that receive monies, but by folks who serve here in Congress.

Mr. DEUTCH. Well, actually some of the folks from the universities should also be sitting here.

Mr. BECERRA. Okay. Well, we had a few a week or so ago, and they did admirably well in defending themselves.

But would you do us--Mr. Chairman, I make the request as part--as a member of the committee--that you give us the information to substantiate--

Mr. DEUTCH. Yes. We will be happy to do that.

Mr. BECERRA. --how the different projects became considerably better from the first stage of review where they were rejected to the final review where they were accepted.

Mr. DEUTCH. We will be happy to do that.

Mr. BECERRA. I appreciate that very much.

[The information follows:]

******** COMMITTEE INSERT ********

Mr. BECERRA. One last question, and I preface it by saying you are absolutely right that the folks that should be sitting at the table there are not just the folks that we have had so far.

You mention that it was your decision to fund these programs, and I think you are actually taking more of the load than you should. Was it your original intention that the review process that was ultimately employed by the Department of Defense be that which ultimately made the decisions on which programs to fund?

Mr. DEUTCH. I'm sorry, I don't understand the question.

Mr. BECERRA. Let me try to phrase it more coherently, and I may actually go right to it. Some time in 1993, did you and a few others from the Department submit to the Secretary of Defense a memorandum on this issue of the earmarks and disposition of the earmarks for fiscal 1992/93.

Mr. DEUTCH. Yes.

Mr. BECERRA. And was it your opinion that a broad interpretation of the programs in their assessment be employed?

Mr. DEUTCH. I don't understand.

Mr. BECERRA. Were you advocating for a broad review process in determining whether these earmarked projects be funded?

Mr. DEUTCH. No. ~~I think at that stage, if I~~ do you remember the date? I mean you obviously have it.

Mr. BECERRA. April 8, 1993.

Mr. DEUTCH. April 8, 1993. As I recall, I was confirmed on April 1, ~~of~~ 1993. I don't want any negative impression to be left as a result of it being April Fool's Day~~, and so~~. ~~what I did was, I--in this particular case~~ I think that at that moment I was of the view that maybe none of these should be funded, and I went and I spoke with my secretary, who ~~is~~ was a former member of this Congress, about what the lay of the land was and how one should think about all these problems, and that began my process of understanding how to deal with these marvelous issues.

Mr. BECERRA. Thank you.

Mr. DEUTCH. But I do remember the memo, and I do remember the occasion and--

Mr. BECERRA. Thank you so much for your responses and your willingness to provide some of the documents that we have requested and responses in writing.

Mr. DEUTCH. Yes, sir.

The CHAIRMAN. I would like to call upon either Mr. Royce or Mr. Smith if they desire to ask questions.

Mr. ROYCE. Thank you, Mr. Chairman. I just have one question for the deputy secretary if I could, and that would be: Will the Department of Defense continue to earmark facilities or fund research programs after the earmarks run out? I'm just interested in how you view this.

Mr. DEUTCH. Only on the basis of merit, sir. Only on the basis of merit.

Mr. ROYCE. Okay.

Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Smith.

Mr. SMITH. Mr. Chairman, no, I have no comments.

The CHAIRMAN. I do want both of you gentlemen to note that in a democratically controlled Congress we are giving hell to a democratically appointed undersecretary.

Mr. ROYCE. Duly noted, Mr. Chairman, and you are doing a fine job of it. Don't let me slow you down.

The CHAIRMAN. But I want you to know that we are trying to be fair and we will pick on the Republicans too if we get a chance.

Mr. ROYCE. I anticipate just that, and I appreciate the job you are doing as chairman because I think this goes to an issue of great concern to this committee and these are questions that really need to be answered.

The CHAIRMAN. Mr. Deutch, we recognize that you enjoyed being here and would like to stay further.

Mr. BECERRA. Mr. Chairman.

The CHAIRMAN. Yes.

Mr. BECERRA. Over here to your right, your geographical right.

~~right~~

The CHAIRMAN. Geographical right.

Mr. BECERRA. Actually, since my colleagues didn't have any questions, I would like to ask one last set of questions.

The CHAIRMAN. Well, I will permit that, but keep in mind that not only are we solicitous of Dr. Deutch's time but we have another witness and we do have to adjourn the committee.

Mr. BECERRA. Yes. I will be brief in this line of questioning.

The CHAIRMAN. Please do.

Mr. BECERRA. It occurs to me that the monies for these earmarked programs was appropriated in 1992. They were. I guess, 12 or so of those 17 were initially rejected for funding. So I suspect the monies, whatever happened to them, were not utilized to fund those 12 or so projects. In 1993, late 1993--and I'll let you explain because I'm not sure of the process, but in 1993 these projects were funded or were approved, and in 1994 I believe the monies were actually let.

I'm looking at I guess it is that same memorandum, and I'm trying to determine how the money was distributed and from where it came, and I'm looking at the bottom--last page of that one memo that, after it specifies all the different programs, it has a note, and it does say the DOD has since advised ODDR&E that other funds will be--well, let me go up and read the entire note. "All of these university grants except the National Center for Acoustics, the West Virginia High Technology Corporation, and Bradley University were included in the $560 million transfer request sent to Congress on January 15, 1993, by President Bush to pay for costs associated with Operation Restore Hope," which was the Somalia operation, so monies were transferred, $560 million were transferred by President Bush from the account that was to be used for Operation Restore Hope. Those monies were transferred from Operation Restore Hope to pay for these earmarks.

It goes on to say, "The DODC has since advised ODDR&E that other funds will be transferred to finance Operation Restore Hope. The money listed in the transfer request is available for release pending a plan for expenditure."

Correct if me if I am wrong, and please do as much as you need to advise me on this, but it seems that some monies were taken from the appropriation under Operation Restore Hope for Somalia to pay for some of these earmarks and that there is an indication that other funds will be transferred to finance Operation Restore Hope to replenish the monies that were taken from the operation.

Mr. DEUTCH. What is the question here, sir? The question is--I'm a little lost.

First of all, the fiscal year 1992 money I think was either no-year money or two-year money, so we had time to use it; and, secondly, this goes back to the prior administration's view that none of these earmarks should be in defense or academic--programs should be funded at all, and if you recall, back at that time there was enormous hostility in Congress, including, I think, this committee, to the unwillingness of the prior administration to fund any of these investment programs. Therefore, there was continually--in reprogrammings, what they would do is put up these areas as sources, knowing that Congress would say no to them.

I don't know what happened at that time to this particular case, but the person who was responsible for this at the time, Alice Maroni, doesn't make mistakes, and I can assure you that it is all in order and that the funds, whether they went in or out because the Restore Hope reprogramming, the result is the same, a decision on whether to fund it this way or not.

I remember this memo very well, and it has an interesting history about education on this matter, that it was here--it was on the basis of this memo that I tried to understand what was possible to do in this area of earmarks, and it really is a very important--has an important memory for me.

It also showed me how far one could go or not go in this matter.

Mr. BECERRA. And I probably was asking you something that was more appropriate for those who are within the Department making the decisions at that time, so I won't ask any further of you to respond because I think it would be difficult for you to read the minds of those who were actually making some of those decisions back then.

I thank you very much.

Mr. DEUTCH. We didn't do all of these anyway.

The CHAIRMAN. Thank you very much, Mr. Becerra.

Dr. Deutch, I do express the same views as Mr. Becerra about placing this great burden on you in view of your multiplicity of other responsibilities. In part you have been selected for this high honor of being crucified here because of your cooperativeness and your willingness to participate in it.

I hope that Dr. Jones has fully been brought up to speed through this exercise and that perhaps she can substitute for you in the future on our more narrowly focused efforts to understand the disposition of those matters within our appropriate jurisdiction.

Mr. DEUTCH. Thank you very much, Mr. Chairman.

Let me say two things. First of all, Dr. Jones has had her conversion in this matter and she is well versed in it, but also let me say that I will always be willing to come to this committee and speak to you about this or any other matter at all times, so you don't have to worry about me coming up here.

The CHAIRMAN. Well, we will try and be as sympathetic of your time demands as we can.

Mr. DEUTCH. Yes, sir.

The CHAIRMAN. I would just like to take slight umbrage at your appropriate effort to put the role for all of those problems back on the Congress. I at least want to share it with you because in the responses you have made to us, you have taken one side in this battle, you haven't been neutral. You would like to be neutral, I know, and I am going to give you the opportunity to be neutral. If you can find some legal justification for your taking the position that you did, I will admit that you were then neutral in this matter. If you can't, then I'm going to accuse you of taking sides in something that you shouldn't have taken sides in, and with that we express our great appreciation to you and hope that things will get better.

Mr. DEUTCH. Thank you, Mr. Chairman.

The CHAIRMAN. Yes.

NOV 09.

Department of Energy
Washington, DC 20585
November 9, 1994

The Honorable George E. Brown
Chairman
Committee on Science, Space and Technology
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is the edited transcript of the testimony given by Joseph F. Vivona, Chief Financial Officer accompanied by Elizabeth E. Smedley, Controller, on October 6, 1994, regarding Academic Earmarks, Part III.

The inserts requested by you and Congressman Barcia are being prepared and will be forwarded to you as expeditiously as possible.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Lillian Owen, on (202) 586-2031.

Very truly yours,

William J. Taylor, III
Assistant Secretary
Congressional and Intergovernmental
Affairs

Enclosure

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Department of Energy
Washington, DC 20585

January 13, 1995

The Honorable Robert S. Walker
Chairman
Committee on Science
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

On November 9, 1994, we sent the edited transcript of the testimony given by Joseph F. Vivona, Chief Financial Officer accompanied by Elizabeth E. Smedley, Controller, regarding Academic Earmarks, Part III.

Enclosed are the inserts requested by Congressmen Brown and Barcia to complete the record.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Lillian Owen, on (202) 586-2031.

Very truly yours,

William J. Taylor, III
Assistant Secretary
Congressional and Intergovernmental
Affairs

Enclosures

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The CHAIRMAN. Our next witness--witnesses are Mr. Joe Vivone, who is the chief financial officer for the Department of Energy, and he is accompanied by Betty Smedley, the comptroller of the Department of Energy.

We welcome you both here.

We do not have with the Department of Energy yet the same problems we had with the Department of Defense; that is, refusing to honor our document requests; and hence we start off on a somewhat better note, which of course may get progressively worse, I don't know, but we welcome you here, and you may present your statement, Mr. Vivone.

09

STATEMENT OF JOSEPH F. VIVONA, CHIEF FINANCIAL OFFICER, U.S. DEPARTMENT OF ENERGY, WASHINGTON, D.C., ACCOMPANIED BY ELIZABETH E. SMEDLEY, CONTROLLER, OFFICE OF CHIEF FINANCIAL OFFICER

Mr. VIVONA. I have just an opening thought, Mr. Chairman. I know that ~~Martha Krebs,~~ Dr. Martha Krebs appeared before the committee a week or two ago. We in the Department understand ~~also know~~ that this is a very difficult issue; and, last, both Betty and I will try to answer any of your questions.

Thank you.

The CHAIRMAN. All right.

Would you care to say a brief word of welcome?

Mrs. SMEDLEY. We appreciate the opportunity to be here, Mr. Chairman.

The CHAIRMAN. I'll bet you do.

Now we have with the Department of Energy received what we consider to be fair responses to our efforts to conduct our oversight duties with respect to earmarking in the Department of Energy. The Department of Energy is one of the most abused Departments in terms of earmarking. You have funded more hospitals, research facilities not related to energy, and other things of that sort than almost any Department. Certainly compared to the Department of Defense, I think you have been a real patsy for Members of Congress who like to do earmarks, end of course we are trying to save you from that great burden in the future.

You have taken the position, however, and this is contrary to the Department of Defense, that you have no obligation or desire to engage in a process of quality review on these earmarks, despite our suggestion to you that something of this sort would conserve the resources that the public entrusts to the Department and would provide better results from the use of those monies.

We had suggested to the Department a process of review which is similar to what is done in some other Departments, and the reaction that we seem to get from the Secretary is that they do not feel that this is justified, that in effect the Department of Energy feels safer in just cutting a check for whatever indicated earmark occurs, and that is whether it is in the bill, in the report language, or possibly coming from some other direction.

You may comment on this if you wish.

We have received from some Departments indication that they have allocated money to projects based upon conversations with staff members of the Appropriations Committee. Dr. Deutch denies that that occurs in the Department of Defense, and you may want to start out by denying that that occurs in the Department of Energy, and if we find that your denial is contradicted by the facts, you are in deep trouble, but you at least deserve the opportunity to deny it.

But the point that I am really making here is, why do you find it so difficult to engage in a process of review and standard setting for earmarked projects when apparently the Department of Defense is able to do this without too much serious repercussions?

Mr. VIVONA. ~~Well, in answer to your, I think, first~~ or ~~second question,~~ to the best of my knowledge, we fund academic earmarks only as prescribed statutorily or in report language, but we will double check.

TO COME: or [See Appendix

㉑ The Department funds academic earmarks only as identified in House, Senate, and Conference reports. The Department does not fund academic earmarks based upon conversations with staff members of the appropriations committee or correspondence from members of Congress.

㉑ ~~Second,~~ once we receive an academic earmark, our internal process attempts to ensure that the projects themselves meet two things. First ~~One is,~~ we try to make sure that the level of academic excellence funded achieves the highest level possible within the ~~that~~ context~~. understand~~ that it was not a part of our budget request but was placed into either report language or statute ~~placed in statutorily~~.

Second, we ~~do~~ make an effort to work with the program~~,~~ and the university~~,~~ or institution involved, to make the project as relevant as possible to the missions of the Department of Energy ~~to the extent possible~~. Again, they are normally not part of our priorities, they are placed in through language.

I should point out that prior to ~~historically pre~~ FY 1993, the level of academic earmarks in the budget ranged up to $150 million or $160 million. Since this debate began, the level has dropped dramatically. Two points. One is, the combined total of earmarks--

The CHAIRMAN. You are referring just to the Department of Energy, I trust.

Mr. VIVONA. Yes.

The CHAIRMAN. Yes.

Mr. VIVONA. With respect to academic earmarks, the combined total over the last two fiscal years is about 50 percent of the total we received in FY 1993, and I think it is largely associated with this debate. It is, in fact, for FY 1995 only 30 percent of the total we received just two years ago. So I think the initiative is working.

(21) Also, our interior appropriation no longer includes academic earmarks. ~~as luck would have it.~~

The CHAIRMAN. We appreciate that report.

We have noted that there has been a decline overall in earmarks. It isn't universal or uniform throughout all the budget categories, but there have been some improvements, and we welcome this, and we welcome the actions taken by the Department of Energy to attempt to reduce these if, in fact, you have been trying to do it.

Do you have any feeling, or would you like to defend the proposition that these earmarks represent a noble gesture on the part of Congress to provide equity and justice in the distribution of funds to academic institutions?

Mr. VIVONA. I worked at a university that attempted to get from a State legislature what would be called academic earmarks, and at the time when making the defense outside of the world of peer review and very aggressive competition they seemed to be justified. I certainly do not ~~--without knowing about it to the~~ extent that I would like~~, I do not~~ believe that they ~~are malintended~~ are intended to be negative allocations. I think they are designed to help an institution.

The question is whether they are related to the programs that we are best at providing. Are they energy related or associated with some of our missions, and ~~do they~~ are they developed in a way that maximizes academics excellence? ~~and~~

I think we can work within that framework to try and achieve those things. But as we have pointed out, ~~I think~~ most recently in a letter to you, [because they lack peer review,] we do not support the process of academic earmarks.

The CHAIRMAN. Do you ever attempt to fund programs that are earmarked, say, in a report from an authorizing committee? Say we pass a Department of Energy bill and in the report we say we think you ought to fund a nice new project in southern California. Would you pay any attention to that?

Mrs. SMEDLEY. Mr. Chairman, as I know you are aware, we normally do not get an authorization bill for our civilian programs. When, in the case of our defense programs, we do get an authorization bill, ~~then~~ we ~~do~~ attempt to comply with the language in those reports just as we attempt to comply with the language in the Appropriations Committee reports.

The CHAIRMAN. Well, I'm trying to be a little more specific than that. The defense authorization bill is intended to provide you policy guidance in the language of the bill. Referring more specifically to directing you to spend money for a specific project or program that is not in the language of the bill but is in the report language from the authorizers, do you recall any instances in which you may have done that?

Mrs. SMEDLEY. Mr. Chairman, I don't recall any instances of specific guidance in a report accompanying an authorization bill, but I know that as a Department it is our policy to carefully review those reports and to be guided by what is in them, so if there were a project so identified in a report accompanying an authorization bill, we would make every effort to try to follow the guidance.

The CHAIRMAN. But you don't recall any such specific guidance. You do recall it in appropriation bills.

Mrs. SMEDLEY. Yes, sir, I do.

The CHAIRMAN. Okay.

Mr. Becerra, would you care ~~do~~ to offer any questions at this point?

Mr. BECERRA. Sure.

Thank you very much for being here. I appreciate it.

I would like to ask some questions that relate to the correspondence dated October 4, 1994, that was received by the chairman of this committee from Secretary O'Leary. Do you have that letter before you?

Mr. VIVONA. Yes.

Mr. BECERRA. Okay. Let me ask you to take a look at a few things. I would like to clarify some of the language in the letter.

At the bottom of the cover page where you get into the Department's process for funding nonstatutory academic earmarks, you state under number 1, "After the appropriations bills are signed into law, the Department's chief financial officer carefully reviews Appropriations Acts and House, Senate, and conference reports to identify academic earmarks." What is meant by Appropriations Acts? Are you talking about acts of law--in other words, the statutes or actions by--

Mr. VIVONA. Yes, the appropriations bill.

Mr. BECERRA. So the word "acts" there should refer to the actual legislative act which would be the statute.

Okay.

Number two, you say each identified academic earmark is formally transmitted to the appropriate managing program for assessment. Define "appropriate managing program."

Mr. VIVONA. There are a number of programs within the Department, Office of Energy Research for example, that would have ~~be~~ relationships relevant to the particular project or its placement in the bill itself.

Mr. BECERRA. So just jurisdiction.

Mr. VIVONA. Yes, within the agency.

Mr. BECERRA. Within the agency. And assessments--appropriate managing program for assessment. Define "assessment."

Mr. VIVONA. The report or statutory language may come to us specific with a dollar amount or calling for the provision of funds. That is what needs to be assessed. We try to follow up on the latter of those two on the following page where the amount is not specified. You need to define what you will do to provide for that particular academic earmark.

Mr. BECERRA. And do you have a structure to undertake this assessment, or is it done on an ad hoc basis? Is there some policy or some rules of procedure?

Mr. VIVONA. Well, again, I think we try to achieve academic excellence and~~, we try to~~ make it as relevant ~~and related~~ to the overall mission of the Department.

Mr. BECERRA. On the second page, the very last paragraph or second to last paragraph, you indicate that the Department and the administration remain opposed to nonstatutory academic earmarks and appropriately look to the Congress for its direction on this matter. Given that you oppose, what kind of direction are you seeking?

Mr. VIVONA. We would seek ~~clarity or terms -- or~~ guidance in terms of how to proceed. We would seek evenness in terms of its application Government-wide. Largely due to the work of the committee, our ratio of dollars associated with academic earmarks has dropped dramatically. I think we might be in the 1 or 2 percent range, and there are larger issues, dollar issues not issues of principle, outside of the Department of Energy.

So we would seek that kind of agreement within the

Congress as to how to proceed. ~~and~~ our advice would be that it be ~~handled evenly, that is to say,~~ applied evenly to all of the departments that are the recipients of academic earmarks either statutorily or through report language. ~~conference language.~~

Mr. BECERRA. If we requested from the Department some guidance on how to proceed so we could give you direction, given your opposition to nonstatutory academic earmarks, what would be your recommendation?

Mr. VIVONA. That would be our guidance. ~~that~~ since they fall outside of better--not perfect but better processes for allocating resources, the Department's ~~advice is or~~ position is that we are not in support of academic earmarks.

Mr. BECERRA. So don't do them. If you are going to do them, give us clear direction on how to use them.

Mr. VIVONA. Correct.

Mr. BECERRA. Okay. In the paragraph right above that, you talk about earmarks that are directed without associated funding that the Department must reallocate resources within existing funding levels. "In all instances the Department strives to minimize the adverse impacts on ongoing mission programs and activities." Are you implying there that at times you have to redirect monies to be able to funds these earmarks which may impinge on funding for other statutorily directed projects and programs?

(21) Mrs. SMEDLEY. What we are trying to say is that when we receive an earmark in report language, in some cases the Congress has taken the program in question and added the amount of money that they earmarked to the budget request, so that it is very clear that we are to do all of the things that are in the budget plus we are to do this new item. In other cases, the Congress doesn't add the full amount of the earmark or appropriates perhaps less than the budget request but stays ~~says~~ within the amount appropriated which provides a specific amount of money for this particular project. It then falls to us to try to determine what program or projects we will not do or ~~we will~~ reduce our level of activity on to accommodate the earmark.

Mr. BECERRA. So is it accurate then to say that at times you find yourself in the position of taking monies from other programs or activities that have been authorized and appropriated for by Congress in order to fund some of these earmarks?

Mrs. SMEDLEY. ~~I think that that~~ that is perhaps not quite correct. ~~because~~ in effect, ~~what~~ we have been given a lump sum ~~is an~~ appropriation ~~for--we don't get line item~~ appropriations. we get a lump sum ~~appropriation~~, and then we receive ~~get~~ guidance in report language as to how we are to spend that lump sum appropriation. ~~and the Congress has~~ given us--and we are talking report language ~~now, we are not talking~~ statute.--

~~So~~ the Congress in the report says that we are to provide a specific level of funding for an activity that was in our budget, and within that level of activity we are to support an item that wasn't in our budget. That is certainly within the prerogative of the Congress to do in reviewing our budget, to indicate they don't want us to spend the full amount of our request as we requested it. ~~and, as I indicated,~~ sometimes they give us specific guidance as to where they would like to make cuts in our budget, other times they don't. ~~and~~ we also receive ~~are--we get~~ guidance that we are to make the reductions in a way that has least adverse impact on ongoing program projects and activities.

The CHAIRMAN. Would the gentleman yield briefly?

Mr. BECERRA. Of course.

The CHAIRMAN. Mrs. Smedley, we received recently--I don't have it right in front of me--a letter from the Secretary requesting reprogramming approval to fund certain earmarks and specifying the accounts authorized by the Congress and respecting an important Department program that would be cut in order to reprogram money. At this point I am going to ask unanimous consent to put that letter in the record reflecting that you do seek at least to take money from existing ongoing authorized programs to some hardship on those programs in order to fund the earmarks.

Now I have that one letter in mind because it occurred recently. There may be many others, and we may want to add to the record later. But I wanted to make that clear.

[The letter follows:]

******** COMMITTEE INSERT ?? ********

methodology suggested by the chairman, that you then come back to us asking reprogramming authority? Is that the methodology used to seek approval from the authorizing committees?

Mr. VIVONA. Only if we must move money around to achieve it~~,~~. ~~but~~ normally ~~no,~~ the money is specified.

Mr. WALKER. What would be your logistical problems in having a policy that says when you get earmarks from one committee, be it, say, an Appropriations Committee, in appropriations, that you would not fulfill those earmarks until you had gotten approval from the authorizing committee, or if the authorizing committee earmarked that you would not--that you would not spend the money until you had gotten approval from the appropriating committee? Would there be a logistical problems for you in putting in place that kind of a policy?

Mr. VIVONA. We have a policy that surrounds academic earmarks and also extends ~~to things other than academic, and also~~ to policy matters; ~~where~~ we receive language, and we attempt to follow it. That is the overall guiding policy.

Mr. WALKER. Yes, but the way you do it now is--let's say this committee goes on a surge of earmarking and we just send down our authorizing bill and we have got earmarks coming out the back and the front of the report. Now at that point, if we can manage to get that through the

Congress and get it passed, if I understand your policy now is, you just say, okay, that is what Congress is demanding of us, we are going to spend the money.

Mr. VIVONA. Well, again, the recent ~~history, the~~ three-year history of academic earmarks has been that they have declined dramatically. They have ~~gone~~ for the Department of Energy~~, not speaking for the other agencies--the Department of Energy has~~ gone down to 30 percent of the level it had reached ~~that it was at~~ in 1993.

Mr. WALKER. Yes, but in all honesty, in large part because of the courage of George Brown.

Mr. VIVONA. That was acknowledged earlier.

Mr. WALKER. You know, that is the reason why they are going down, is because you have had a chairman that has been willing to stand up against this because he realized that this was destroying the science base of the country. Somewhere along the line you are likely to get it coming back, and I'd like to think that we could put in place a policy that doesn't demand always a handful of people in the House or in the Senate trying to stand up against the flood, that the Departments themselves would say this is bad policy, this is not something that should be done, and at the very least we ought to have both authorizers and appropriators sign off on anything before we put it into effect, and I'm asking you what are your logistical problems in getting that done?

~~in getting that done?~~

① Mr. VIVONA. I would suggest that it is more related to the level of authority. We think that it is something that the Congress is best able to handle. We are not in the position to handle it. It is a matter of getting guidance on the issue of academic earmarks from the House and the Senate where there may be disagreements within that body regarding the treatment of academic earmarks.

Mr. WALKER. You can make a policy on this. You are in a position to be able to make some of those decisions. If that were your policy with regard to earmarks, it would be understood that that is going to happen. The fact is that what usually happens on this--and it isn't even much Member involvement. I mean in most of these agencies, and to some extent I'm blaming the wrong people here, but I have seen instances where you end up being under the thumb of some Senate staffer or some House staffer off the Appropriations Committee, it is not even the Members that are in touch with you.

I mean if you have a staff member calling you and saying, "Let me tell you what this language in the report means, it may be a little unclear to you, but let me tell you exactly what we intend for you to do," and we have got agencies that say, "Well, if that's what you intend, then that's what we are going to do," and we don't find out about it until months later even on the authorizing committee, and I'm saying, that is not even direct commands, that is kind of indirect commands through staff saying that this rather undefined language means that you are to pump money into the chairman's district, and time and time again agencies react to that.

Now what I am suggesting is, there must be some kind of policy that could assure that there is a broader base than a couple of staff Members on Capitol Hill that sign off on these things before they take place.

Mr. VIVONA. If there was an attempt to direct us in that fashion, we would not be involved; ~~in that,~~ we would compete the project. We react very directly to conference language. ~~not to the and~~ I have never received a call in this regard, although I have only been around for four or five months.

Mr. WALKER. You will.

Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Barca.

Mr. BARCA. I wonder in terms of policy that the Department of Energy has established, you know, per the letter that was given to us by the Secretary, it indicates that this is your express policy, to comply with report language. Has that always been the policy of the Department of Energy? Is there something in writing that exists that transcends administration to administration?

Mr. VIVONA. It has been the Department of Energy's policy.

Mr. BARCA. Since the inception of the Department of Energy?

Mr. VIVONA. It has been 14 years, as far as we know on this table.

Mr. BARCA. Okay.

Then secondly, the question I would have is that, generally speaking--well, I think probably exclusively speaking based on what we have heard--you are talking about the report language that accompanies appropriation reports. Now what if--would your policy be the same if, let's say, accompanying a Budget Act, in the Budget Act report, if there were a similar kind of earmark put into report language for the Budget Act report, would you treat that exactly the same?

Mr. VIVONA. We try to follow the guidance~~, again,~~ within the constraints of what the dollars allow in the appropriations bill.

Mr. BARCA. All right. I'm asking a different question though. I'm asking that if in the budget--pardon me?

Mr. VIVONA. Or an authorization bill, for example, is what you might be referring to.

Mr. BARCA. The other point I want to just raise is, when we had the EPA before our committee, they had given us some documents to our committee that had given us the distinct impression that they had awarded funding to a given academic institution where there was no report language, where there was no statutory language, but strictly on the occasion of a person calling saying that that was what the committee intended to have occur. To the best of your knowledge, has that ever occurred in the Department of Energy?

Mr. VIVONA. That has not occurred. We promised the chair that we would triple check it, but in preparing for ~~the~~ this hearing, that was an ~~one~~ issue. ~~and~~ we in-house discussed it, and it is not the case.

㉑ The Department funds academic earmarks only as identified in appropriations acts as well as House, Senate, and Conference reports. The Department does not fund academic earmarks based upon telephone conversations with committee staff members.

Mr. BARCA. And your policy would be to not allow that to occur should it happen in the future.

Mr. VIVONA. Yes.

Mr. BARCA. In this policy that we are referring to, is that a written policy that you have some place that you could share with the committee? Is that written up?

Mr. VIVONA. It has certainly been the practice of the Department. I can check to see if we have ever said it in writing, but I'm sure that in ~~reacting over~~ the two-year period with which this issue has really been highlighted, we have stated it in correspondence on several occasions. It is the stated policy.

Mr. BARCA. You had said, if I understood you correctly, that really since the inception of the Department of Energy it has always been the policy of the Department of Energy to do this, and I just wonder, is there a written policy some place that we could get a copy of so we could get a better understanding of this policy?

Mr. VIVONA. ~~We do it by way of what we call budget guidance internally~~ We do it internally by way of budget guidance, but we don't have a policy directive.

Mr. BARCA. Okay, so there is not a policy directive.

Mr. VIVONA. Not ~~S~~pecifically to earmarks.

㉑ Mr. BARCA. So in other words, there is not a written policy. There has never been a policy directive from the Secretary or some written policy to--

Mrs. SMEDLEY. We have a budget manual that is operative in the Department which provides general guidance on how we are going to execute the budget in accordance with the direction that comes from the Congress. As far as lines specified in the Appropriations Committee reports, we certainly don't have a specific policy titled academic earmarks, but our budget execution policy sets thresholds against which we will control our money to execute our budget in accordance with the direction that the Congress had provided.

Mr. BARCA. Okay.

Have you ever--have there ever been instances where there has been just a real tremendous gray area in terms of the report language where it has just been completely unclear, where you have sought counsel's opinion in terms of whether or not you should comply or how you should handle that particular circumstance?

Mr. VIVONA. Betty Smedley, the controller, has been around for 14 years or so, and she doesn't recall ~~on~~

Mr. BARCA. Any instance where that has occurred?

Mr. VIVONA. Correct.

Mr. BARCA. Okay. It is usually much clearer than that.

I have no further questions, Mr. Chairman.

The CHAIRMAN. One additional point that I just want to reemphasize. We have suggested that you should adopt a system of reviewing these earmarks. This is really an example of our great flexibility here. Bad as they are, they are even worse if they are not reviewed, and we might be not quite as harsh on them if they were subjected to some effort to make sure that you screen out the complete dogs and have as high a quality of program as possible here. We are quite serious about this, and we would like the Department to give us a serious response as to why they couldn't do something which is working fairly well in other Departments.

We appreciate the fact that you have a continuing decline in the number of earmarks. We think that this process might encourage a further decline, frankly, but it is part of an arsenal of things that we are suggesting in the hopes that we can move this whole system of using taxpayers' money back to a level of efficiency and effectiveness which I think the taxpayers are entitled to.

So would you be kind enough to indicate to the Secretary, or whatever you need to do, that we attach a high degree of importance to this and would really request a reasoned response as to either we would like to try something like this or we think it is impossible for X number of reasons?

Mr. VIVONA. We certainly will bring ~~this~~ that message back.

The CHAIRMAN. All right.

And do we have any reason to harass them further?

Mr. PEARSON. No.

The CHAIRMAN. In that case we repeat our thanks to you for coming over. You have noted and we are well aware that you don't often get authorizing legislation from this committee that passes both Houses of Congress.

Mr. VIVONA. Yes.

The CHAIRMAN. Not because we don't try. We think we are making some progress, so we have fairly firm commitment from the Senators on the other side that they will be more cooperative in adopting authorizing legislation in future years. They are probably not going to be enthusiastic about using that to curtail earmarks, but who knows? The world may be changing more rapidly than we hope.

Thanks again, and the committee will be adjourned.

[Whereupon, at 10:38 a.m., the committee was adjourned.]

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